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Details of Steel Cores *for* Reinforced Concrete Columns

SINCE the early part of 1928 a number of articles have appeared in technical magazines in which the authors deal with various phases of details involved in the use of structural steel cores in the lower-story columns of tall reinforced concrete buildings.

None of the articles which have come to my attention, and this includes one of which I was the author, covers all items in which the designer will be interested. It is therefore the purpose of this article to give the readers of "Concrete" an illustrated description covering the practice in our office, supplemented by descriptions of methods employed in other offices in dealing with similar details. A few points of interest to erectors will likewise be included.—***Frank A. Randall.***

By **FRANK A. RANDALL**
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THE purpose of structural steel cores in reinforced concrete columns is primarily that of reducing the column sizes below the sizes that are practicable with the ordinary type of reinforced concrete design.

Usually a definite limit is set on column sizes. For illustration, our office obtains a set of plans from an architect with the stipulation that column sizes must not exceed certain stated dimensions. For the upper parts of the structure we follow the usual practice of designing spirally reinforced concrete columns of the ordinary circular core type. The finished column, with the concrete fireproofing in place, is usually square or rectangular. The minimum thickness of the fireproofing outside the steel section will depend largely on the requirements of the city building code having jurisdiction. The Chicago building code, for example, will not permit a concrete-encased structural steel column having 2 in. of concrete outside the steel to carry a greater load than if the same column is fireproofed with tile units. That is, the steel is assumed as carrying all the load, and the allowable working stress, in pounds per square inch, is 16,000 — 70 L/R, but in no case more than 14,000 lbs. However, if the steel column has a minimum covering of three inches of concrete the working load on the steel section, expressed in pounds per square inch, may be 18,000 — 70 L/R, but not more than 16,000 lbs. No figuring is required to convince the designer that the additional inch of concrete should be provided, to obtain the benefit of the additional 2,000 lbs. per sq. in. in working stress.

Building Code Requirements

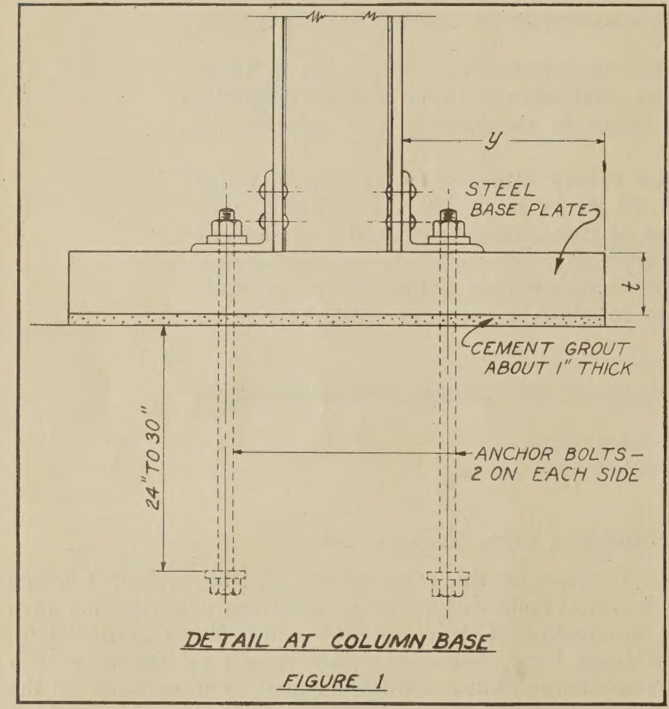
Because of the requirements of the present Chicago building code we do not give serious consideration to a combination of structural steel and ordinary vertical reinforcing bars. The code would permit the use of such a combination, but it would be necessary to consider all the steel as reinforcing steel. That is, the allowable working stress in *all* steel would be n times the working stress in the concrete, where n is the ratio of the modulus of elasticity of structural steel to that of concrete. This would mean an allowable stress of only about 7,500 lbs. per sq. in. on the structural steel, instead of 16,000. Such a column would be extremely uneconomical. We accordingly omit all reinforcing bars, the structural steel section being the only metal in the column.

There is much variation in the requirements of different building codes, and it is necessary in all cases to study the code having jurisdiction, with the view of taking full advantage of the provisions dealing with column design.

Same Column Size Maintained

The use of steel cores has the further advantage of helping to maintain the same over-all column dimensions throughout many stories of a building. We invariably use column cores of H-section. As the column load increases we use heavier sections, but of the same nominal size, so that the outside dimensions of the concrete encasing may remain practically unchanged. Even in the upper stories, where ordinary spirally reinforced concrete columns are used, the advantage in maintaining the same column size may outweigh all other considerations. For instance, at points where column sizes are changed, the length of the girders framing into them must be changed also. Consequently the form-work for the girders must be altered. The same is true of the form-work for exterior spandrel walls. In hotels, apartments or office buildings many floors are identical in plan. If column sizes are changed, the interior trim and tile work built around them must likewise be modified, and full advantage can not be taken of the repetition of floor plans. Consideration of these points leads to the conclusion that the higher cost of a column having a structural steel core will be at least in part offset by the advantages obtained through maintenance of uniform size.

It is unfortunate that only a few city building codes give proper recognition to the great increase in strength obtained by encasing a steel column in concrete, as compared with the steel section considered alone. As far back as 1912 a number of tests made at the University of Illinois indicated that the strength of concrete-encased steel columns is equal to that of the steel section with its slenderness ratio taken into account, plus the strength of the concrete in compression without regard to the slenderness ratio of the column. Those tests, fully reported in Bulletin No. 56 of the University of Illinois Engineering Experiment Station, indicate that such columns act as composite structural units and that their modulus of elasticity differs from that of concrete alone.



DETAIL AT COLUMN BASE

FIGURE 1

Structural Details

Let us now consider the structural details involved in the use of these columns, keeping in mind that the columns contain no metal other than the structural steel H-section, and that the girders framing into them are reinforced concrete girders of the usual type. Points of special interest will be the following:

(1) Details at the column base.
(2) The column cap, where the change is made to the ordinary reinforced concrete type of column.
(3) Details where floor girders frame into interior columns.
(4) Wall columns and corner columns.
(5) Structural steel shop details.
(6) Erection of column cores.

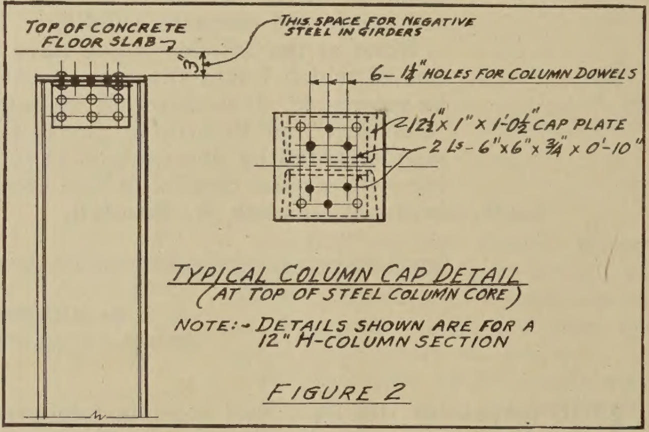
The foregoing features will now be discussed in the order named.

The Column Base

Figure 1 shows a detail of a typical column base. The base plate consists of a square or rectangular steel plate set on cement grout approximately one inch thick. The area of the base plate, in square inches, is obtained by dividing the column load (in pounds) by 600. The figure 600 represents the allowable bearing, in pounds per square inch, on the concrete pedestal. The end of the steel H-section is milled and is fastened to the plate by two angles, as shown in the detail. The size of these angles will of course vary with the size of the plate, but ordinarily we find 6 by 6 in. or 8 by 8 in. angles sufficient for the purpose. Four anchor bolts are provided, extending from 24 to 30 in. into the concrete pedestal. Aside from the anchor bolts there is no other connection between the column and the base plate.

The thickness of the steel base plate depends on the projection of the plate beyond the edges of the steel column. In Figure 1, let y represent this projection, expressed in inches, and let t represent the thickness of the plate, also expressed in inches. Assuming a column load of such amount that the pressure under the base plate is 600 lbs. per sq. in., and taking 18,000 lbs. per sq. in. as the allowable bending stress in steel, the required thickness of the plate is—

$$t = 0.316\,y$$


TOP OF CONCRETE FLOOR SLAB
THIS SPACE FOR NEGATIVE STEEL IN GIRDERS
3"
6 – 1¼" HOLES FOR COLUMN DOWELS
12½" x 1" x 1'-0½" CAP PLATE
2 Ls – 6"x6"x ¾" x 0'-10"
NOTE: – DETAILS SHOWN ARE FOR A 12" H-COLUMN SECTION

TYPICAL COLUMN CAP DETAIL (AT TOP OF STEEL COLUMN CORE)

FIGURE 2

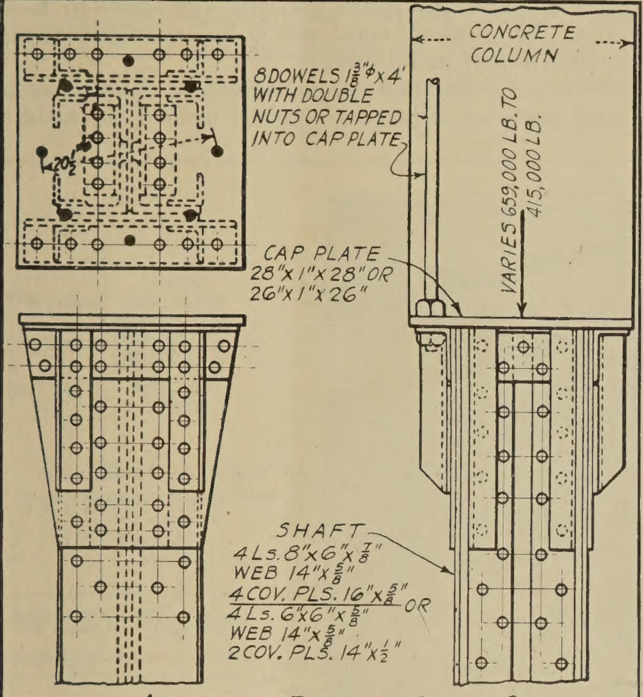
The Column Cap

Figure 2 is a detail of the column cap at the point where the steel core is discontinued and the ordinary reinforced concrete column begins. To get an effective splice between the two types of construction a plate is riveted to the head of the structural steel core. This plate has six drilled holes for the insertion of steel bars cut in lengths of 80 diameters which serve as dowels and form an effective tie between the two types of columns. The dowels are placed so as to extend equal distances above and below the cap plate. Usually we drill these holes to a diameter of 1¼ in. for the insertion of dowels of 1 in. diameter.

Figure 3 illustrates another column cap detail, as recommended by R. C. Reese, in which the cap consists of a light plate supported by wing plates, bracket angles and stiffeners, with dowels bolted to the plate.

Girders Framing Into Columns

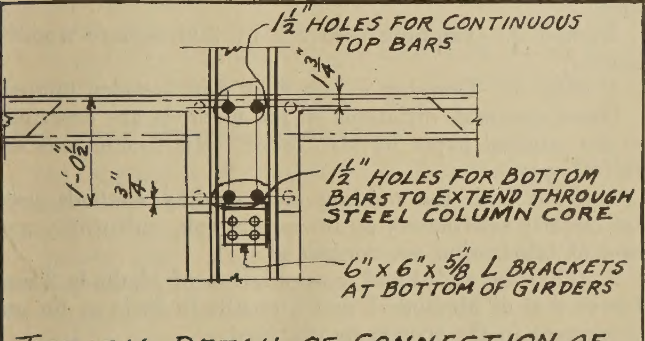
The girders framing into the steel core columns are the regular reinforced concrete type. Details of the connections between these girders and the columns are shown in Figure 4. As a means of adding to the bearing value of the connection, we attach angle brackets on a level with the bottom of the girder. For these brackets we use 6 by 6 by 5/8 in. angles.


CONCRETE COLUMN
8 DOWELS 1 3/8"φ x 4' WITH DOUBLE NUTS OR TAPPED INTO CAP PLATE
20½"
VARIES 653,000 LB. TO 415,000 LB.
CAP PLATE 28"x1"x28" OR 26"x1"x26"
SHAFT
4 Ls. 8"x6"x7/8"
WEB 14"x5/8"
4 COV. PLS. 16"x5/8" OR
4 Ls. 6"x6"x5/8"
WEB 14"x5/8"
2 COV. PLS. 14"x1/2"

ALTERNATE DETAIL OF COLUMN CAP

FIGURE 3.

The most interesting and at the same time the most important detail about this connection is the manner in which the longitudinal girder reinforcement is utilized. Ordinarily we have four main longitudinal reinforcing bars in the bottom of a girder at mid-span. Two of these bars are straight and are passed through two holes drilled in the structural steel section, near the bottom of the girder when such bars are required for negative reinforcement. The two straight bars from the girder on the opposite side of the column are passed alongside the structural steel action. The two bars of the main girder reinforcement that are bent up are passed through two holes drilled in the structural steel section near the top of the girder. Necessarily the same bars can not be bent up at both ends of the girder. The two corresponding bars from the opposite girder are bent up in similar fashion and are passed along the outside of the steel section. It is necessary in this case to cant the bars slightly away from the vertical, but there is no structural objection to this arrangement.


1½" HOLES FOR CONTINUOUS TOP BARS
3/4"
1'-0½"
3/4"
1½" HOLES FOR BOTTOM BARS TO EXTEND THROUGH STEEL COLUMN CORE
6"x6"x5/8 L BRACKETS AT BOTTOM OF GIRDERS

TYPICAL DETAIL OF CONNECTION OF CONCRETE GIRDER TO STEEL COLUMN

FIGURE 4

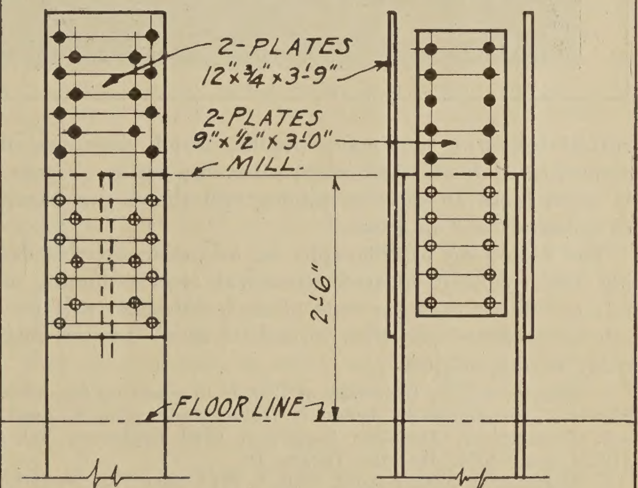
When girders frame into columns from four directions, care must be taken that the holes drilled through the column flanges are either above or below those drilled through the web. The size of the holes depends on the size of the largest bars in the girder.

Wall Columns and Corner Columns

In wall columns and corner columns our purpose is to increase the rigidity of the connection between columns and girders so as to obtain the greatest possible resistance to wind stress. Ordinarily we use two straight bars in the top and in the bottom of wall girders. The two top bars are passed through the two upper holes in the steel column section, while the bars from the opposite direction are passed outside the steel column section. The two straight bars in the bottom of the wall girder are passed through the two lower holes, and the straight bars from the opposite girders are passed along the side of the steel section.

At corner columns we provide a definite connection between the concrete girders and the structural steel core by threaded dowels anchored to the columns with nuts and washers.

DETAIL OF COLUMN SPLICE.



NOTE:- DETAILS SHOWN ARE FOR 12" - 140.5# H-COLUMN SECTION.

FIGURE 5

Shop Details; Column Splices

It is somewhat difficult to furnish steel fabricating shops with the information necessary to detail these steel column sections, for the reason that the work differs from that to which their engineering departments are accustomed. When we first employed these column cores we had trouble on that account, and our practice now is to draw up complete shop details in our own office.

We design our column sections in two-story lengths. At first we considered the possible advantages of avoiding splices by using column lengths of 60 to 80 ft., but we came to the conclusion that the advantages gained through the elimination of splices would be more than offset by the greater difficulties and the higher cost of erection.

The two-story lengths are not inconvenient to handle. In our practice we make the column splices more substantial than one finds in common practice. In fact this is our practice in the design of complete steel-frame buildings. A typical splice detail is shown in Figure 5.

As just stated, the columns are fabricated in two-story lengths. It is seldom that the weight of a two-story section exceeds two or three tons. These are usually handled by an A-frame, which is moved about on the concrete floor by rollers operating on heavy planks, which distribute the concentrated loads that might otherwise occur. Figure 6 is taken from an erection photograph showing a number of column cores in place.

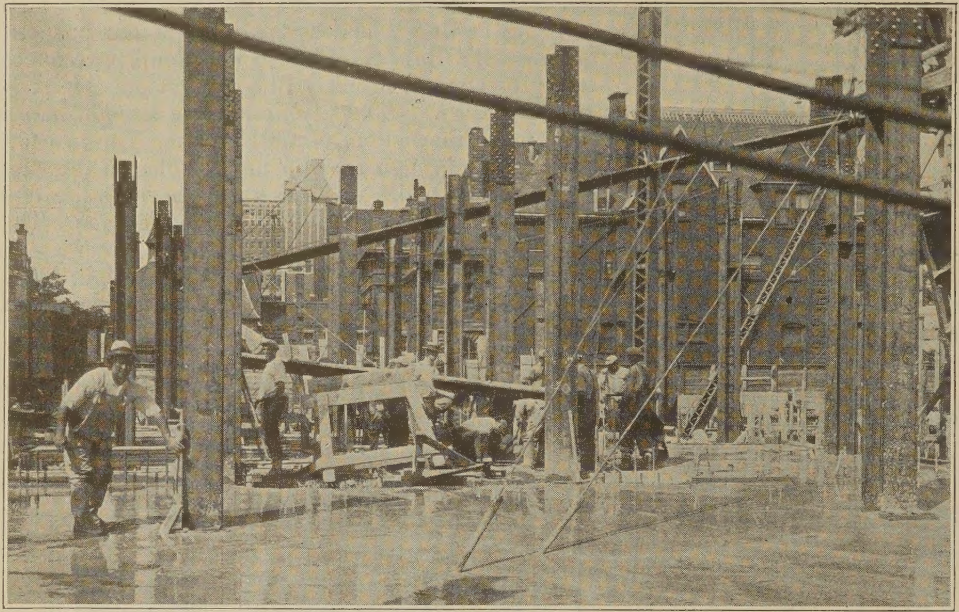


Figure 6. Showing the placing of a number of column cores

The following bibliography of magazine articles dealing with concrete-encased structural steel columns, and reports of compression tests of such columns, will be of interest to those who wish to make a more comprehensive study of this subject.

1. *Bulletin No.* 56, University of Illinois Engineering Experiment Station. Column tests by Arthur N. Talbot and Arthur R. Lord.
2. *Transactions,* American Society of Civil Engineers, Vol. 86 (1923), page 1074. By John Tucker, Jr.
3. *Engineering News-Record,* Sept. 5, 1929, page 372. News item on column tests under way at the U. S. Bureau of Standards.
4. Article by H. H. Alger in *Engineering and Contracting,* March, 1928, page 167.
5. Article by Frank A. Randall in *Engineering News-Record,* July 19, 1928, page 88.
6. Article by W. W. Hay in *Engineering New-Record,* October 18, 1928, page 591.
7. Article by R. C. Reese in *Engineering News-Record,* October 18, 1928, page 593.
8. Article in *Engineering News-Record,* July 25, 1929, page 129.
9. Article in *Engineering and Contracting,* October, 1929, page 405.

Adoption of Standard Procedure for Transverse Testing by A. S. T. M.

Due to variations in transverse strength which would seem to be possible due to modifications in methods of molding and testing specimens, the American Society for Testing Materials is looking into the possibility of the adoption of a standard procedure for transverse testing.

Work is now under way in a sub-committee under the chairmanship of A. T. Goldbeck with this end in view.

Preliminary work has been done looking into the influence of certain variables in the molding of concrete specimens. This work was performed at the U. S. Bureau of Public Roads and was reported to the A. S. T. M. Committee C-9 on Concrete and Concrete Aggregates by L. W. Teller. The methods employed in his investigations may be stated briefly as follows:

Method 1.—Rodding specimens with a ⅝-in. diameter round steel rod, using the standard method for molding compression specimens.

Method 2.—Identical with Method 1 except that each layer of concrete was rodded fifty times.

Method 3.—Spading with a spade 4½ in. wide and 6 in. long. The concrete was placed in two layers and each layer was spaded twenty times.

Method 4.—Identical with Method 3 except that each layer of concrete was spaded fifty times instead of twenty times.

Method 5.—Tamping with a 2 by 2-in. square wooden tamper.

Method 6.—Tamping with a 4 by 4-in. wooden tamper.

Other essential variations in the methods are described in the original paper by Mr. Teller. His conclusions are as follows:

1. That both the rodding and spading methods used are equally satisfactory so far as strength, uniformity and ease of fabrication are concerned.
2. That the additional manipulation of Methods 2 and 4 over that of Methods 1 and 3 results in little or no improvement in the specimens obtained.
3. That the tamping methods are not as satisfactory as are the rodding or spading methods.

COMING CONVENTIONS

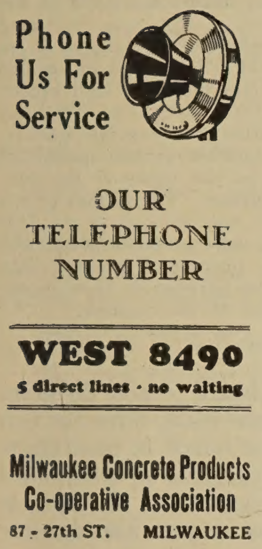
American Concrete Institute—February 11th to 13th. Annual convention, at New Orleans, La.

American Road Builders Association — January 11th to 18th, 1930. 27th annual convention and road show, at Atlantic City, New Jersey.

Is *This* the Way Out?

How the Milwaukee Concrete Products Co-operative Association is Applying Co-operative Farm Marketing Conditions to the Concrete Products Industry—How the Association is Organized and How It Functions

By "SPEC" COLLINS
Manager, Milwaukee Concrete Products Co-Operative Association



Phone Us For Service

OUR TELEPHONE NUMBER

WEST 8490
5 direct lines - no waiting

Milwaukee Concrete Products Co-operative Association
87 - 27th ST. MILWAUKEE

Because the Association phone number is not yet in the 'phone book, blotters of this sort go out with every mailing to teach customers where to call to get blocks

MILWAUKEE'S new Concrete Products Co-Operative Association is exciting interest among concrete products manufacturers the length and breadth of the United States. They are asking themselves the question, "Is this the way out of the rather precarious situation into which we have worked ourselves—or is it just the first step in the way out?" It seems a logical step in advance—a step decidedly in tune with national interest developed in co-operative marketing organizations through the vast amount of negotiations and publicity accorded this method of marketing through the development of the Federal Farm Board. Milwaukee concrete products manufacturers have simply taken the scheme developed for the formation of co-operative farm marketing organizations and have applied it to their own business. There is no great mystery about the organization; it is a true co-operative developed to take over the problem of marketing concrete products in a businesslike manner, in a way that will do away with much waste and duplication of effort and in a manner that will save much money for its members and put them on a sounder financial basis.

The Dread Disease—"Volumitis"

The picture of the concrete products business in Milwaukee County six months ago and prior to the organization of the co-operative is one that can be duplicated today in twenty other large concrete products manufacturing centers throughout the United States. Modern merchandising methods and an attack of "volumitis" had developed to such an extent that in the struggle for business—in the endeavor to keep every plant running to peak capacity—all thought of sales based on a reasonable profit had faded out of the picture. "Get the business"—that seemed to be the thought of most of the manufacturers. Nine to twelve concrete products salesmen were "hitting" every job. Naturally, in this anxiety to get a large volume of business, prices were being constantly hammered down—with sales expense constantly mounting. Profits were a thing of the past. Concrete products manufacturers in the business for over a decade were for the first time in their business lives "writing it in red." Something had to be done. The business was wrecking itself and would soon be in a condition so that manufacturers of competitive material would be able to step in and seize the market.

A Momentous Conference

Then, one afternoon a small group of manufacturers—bitter business enemies, all of them—assembled in a west side office to review the situation. They just couldn't go on the way they had been. That was sure. The only solution to the problem seemed to be co-operative marketing. A co-operative marketing association had been set up earlier in the year by the mineral aggregate dealers. This was already affecting the concrete products business, for these men were insisting on payment of all bills promptly and mason contractors were paying their bills for aggregate and slighting the concrete products dealer.

The questions foremost in the minds of these men at this preliminary meeting were, "What will such an organization cost us?" and "What will such an organization save us?" The consensus of opinion seemed to be that it would save their business for them and that while its cost at the offset would about equal the present cost of marketing, by a stabilization of price, an ending of competitive methods ruinous to the business, by a remedying of a serious credit situation and a final cut in delivery charges by apportioning deliveries wherever possible to the plant nearest the job money could be saved. These things could not all be accomplished at one time—that was conceded—but it was felt that as the organization developed and new members were added the scheme would gradually work itself to the focal point set for it by its instigators.

With these things in mind more meetings were held, more plans laid, a firm of attorneys familiar with the Wisconsin Marketing Act consulted and the organization of the project put under way. The bright point in this work of preliminary organization was the manner in which this work went ahead. The men working on the project soon found out that their bitterest business rivals all had their good points—that under the skin they were just human and by working *with* them much more could be accomplished than by working against them.

Ten Nights in a Bar-Room

Most meetings of Milwaukee concrete products manufacturers up to this time had been held in the rear room of a saloon on the west side. But with this bigger thing at stake, activities and headquarters were shifted to a prominent downtown club. As one of the men put it—"We spent ten nights in a bar-room and never got anywhere, but we move down here with better surroundings and better food and everyone just seems to come out of shell and act more like a human being."

With the preliminary contract drawn up plans were immediately put under way to secure signatures to it. Each plant was to be put on a quota basis—this quota to be established by an average of 1927 and 1928 business.

Quotas were checked and rechecked from every source available and the work of signing up members was started. When what was felt to be 80 per cent of the production in Milwaukee County was signed up the final steps in the perfection of the organization were concluded—the incorporation of a non-stock co-operative association under the Wisconsin Marketing Act of 1927.

This corporation is known as the Milwaukee Concrete Products Co-Operative Association. Perhaps the best manner to review its workings is a review of the articles of incorporation. Its purposes as set forth in these articles are "to provide facilities to its members for the co-operative marketing of their products through the association, to secure for its members additional economy and efficiency through the employment of a co-operative organization, to secure for its members adequate outlet for their products and to lease, hold, mortgage, sell or convey such real estate or personal property as may be necessary or convenient for the general purpose of the association."

How the Association is Organized

The association is organized without capital stock and any individual partnership or corporation engaged in the manufacture of concrete products in Milwaukee County is eligible to membership on signing a membership roll and upon acceptance by a majority of the board of directors at any of their regular or special meetings. No corporation or firm is, however, entitled to more than one membership in the association. Each of these members is entitled to participate in profits in proportion to the volume of business contracted by members with the association. Each member on signing the membership roll obligates himself to enter into a contract with the association, the essence of which is as follows:

1. Such member will from the date of execution of such contract up to and including June 30th, 1932, sell exclusively to and through the Association all the standard concrete products made of sand, gravel or crushed stone combined with portland cement, which each member shall produce or deliver in Milwaukee County, Wisconsin. These sales shall be apportioned on a predetermined quota basis, the Board of Directors reserving the right, from time to time, to revise the quota of any member for the purpose of correcting any error that may be found, for keeping such quotas in proportion to the production facilities should such facilities materially change or upon securing new members.

2. The members shall make no sales of standard products designed for use in Milwaukee County except to or through the Association, and for any such sale in violation of the contract the member making the sale shall be liable for penalty to the extent of thirty per cent of the sale price. Members may make sales directly at their yard to purchasers, but these sales must be reported to the Association and the member making the sale shall be responsible for payment at the Association standard price.

3. The total business of the Association shall be distributed to members according to an agreed on quota. The quota of each member shall be determined by the average of the gross sales made by this member during the calendar years 1927-28 and shall be distributed among members in the proportion this bears to the whole.

4. The Association agrees to maintain an adequate sales organization for the solicitation of orders and the securing of contracts to be filled by members of the Association. Members agree to make a daily report to the offices of the Association on a form devised by the Association giving a record of the deliveries made for and on behalf of the Association. The figures obtained from these daily reports are applied against the quota of the member.

5. If at the end of the fiscal year any member who has made, by inadvertence of the Association, deliveries in excess of his quota he shall pay the Association an amount equal to 15 per cent of the standard sales price on such products. On the other hand, if deliveries are below the quota the Association shall pay to members who have not received orders equal to their quotas an amount equal to 7½ per cent of the sales price of this deficiency.

6. Losses resulting from bad debts, all organization, operating and other expenses of the Association are borne by members in proportion to their quotas. The Association provides for these funds for its operating and other expenses by fixing a standard price for its products and which price is paid by the Association to all members. This price must bear such relation to the prevailing retail price to afford the Association sufficient gross profit to meet all expenses of conducting the Association, including the cost of discounting sales orders. This price is set by the Board of Directors and may be changed by them from time to time.

7. Subject to its ability to collect the Association agrees to pay each member, on or before the 15th day of each month the standard price referred to above, less 12 per cent on all deliveries made during the preceding month. This 12 per cent is retained by the Association to cover bad debts, operating expenses, taxes and organization expense and after these expenses are deducted, is divided among the members every three months in proportion to the amount of business they have done with the Association.

8. Members agree to deliver or procure the delivery of such material as the Association orders and to such places as it orders. If the member ordered to make delivery does not have the particular stock needed on hand he may procure it from some other member. It is understood in a case like this that the member receiving the order from the Association must bill delivery against the Association in a manner that does not disturb the quota of the member from whom he purchased it.

If, however, the member ordered to make delivery fails to do so without what the Board of Directors considers just cause an amount of units so undelivered may be taken from his quota and apportioned to the quotas of other members.

9. The Board of Directors is given authority to regulate quality, grade, condition of materials, current market prices, quotas of members and all other matters which, by the terms of the contract, are committed to them for determination. The rulings of the Board are held as final and conclusive.

10. Each member agrees, upon signing the contract to permit the Association to examine his books for the purpose of securing data upon which quotas are based and for the purpose of ascertaining what sales, if any, were made in violation of the contract.

Association Officers

The association is governed by a board of nine directors —three of whom are elected for three years, three for two years and three for one year. The board in turn elects the officers from its members. A majority of this board has the authority to act for the association at any special or regular meeting or can for cause remove any director or office and fill the vacancy caused.

As soon as the corporation was completed a manager was hired, quarters rented and help employed to work out the many details of the organization. Wherever possible the personnel was drawn from member plants and gave the new organization the benefit of concrete products experience. At the same time this provided a means of immediately relieving the financial strain on plants who would no longer need salesmen or excess office help. The association has, in addition to the manager, four salesmen, a man devoting his entire time to credits and collections and three girls in the central office. A ground floor office was rented. This is centrally located and is outside of the restricted parking district—a point worth considering in selecting an office for a business of this sort where contractors are constantly calling and where everything possible must be done to cultivate the good will of the trade.

Getting Under Way

One of the first moves was that of building up an adequate credit file. Cards were distributed to all members asking them to give certain pertinent information on all accounts not over two years old. This resulted in a credit file containing over one thousand names and from the information on these cards credit ratings of customers were established. At the present time these records are being rechecked and certain information being transferred to a visible file that is easily accessible to the entire office.

At the outset it was decided by the directors to, as far as possible, respect the wishes of contractors desiring particular blocks. All orders which are phoned in to individual member plants must be relayed to the association office and an O. K. given before delivery starts. In fact they must receive two O. K.'s—one as to the customer's credit and the other as to whether the plant phoning in the order is to be allowed to deliver because of a difference in quota assignment. The credit situation is a serious one in Milwaukee. Too much speculative building and "financing" by building material dealers has resulted in a healthy crop of fly-by-night contractors with little or no assets. It is the general sentiment among association members that with a central credit bureau such as the association maintains that the savings effected on collections will go far toward paying the operating expenses of the organization.

Another thing that was done at the outset was to secure a listing of all jobs that had been contracted for by individual members. This was done for two reasons—to get a line on accounts and to check prices charged against standard association prices. At the outset no change in price was made. The first of August a slight change was made in the price of a few units. Otherwise prices have not been tampered with.

Acquainting Contractors with the Association

It was felt that a frank statement about the association and its purposes was necessary to clear up some doubt that had arisen in the minds of contractors. Accordingly the following bulletin was issued to all Milwaukee contractors two days after the offices were opened.

> ***What Is This New Association?***
>
> The block men have put the selling of all concrete blocks in the hands of a central organization, the Milwaukee Concrete Products Co-operative Association, which will employ men to do the selling.
>
> ***How Will This Affect the Price of Blocks?***
>
> For the past two years the block men have not made any money and the price of blocks must be increased. By cutting down selling costs, delivery costs and credit losses we hope, in time, to pass these savings along to you and at the same time leave ourselves a fair profit. This price *must* be a fair price for it will be passed on by the Wisconsin Marketing Commission.
>
> ***How Will This New Association Benefit the Contractor?***
>
> It will stabilize the price of blocks. The price to all contractors will be the same.
> It will do away with the unresponsible contractor who has little else but a trowel and mortar board as his financial backing and has little right to credit.
> It will enable the block men to separate the contractors from owner buyers and give the contractor the benefit of his discount for prompt payment of bills.
>
> ***Will My Credit Be Good with the Association?***
>
> If you have always paid your bills in the past you can get the same line of credit from the Association.
>
> ***How Do I Order Blocks from the Association?***
>
> All orders for blocks should be placed through the Association. In most cases you will probably get the same block you have been using.
>
> ***Come in and See Us***
>
> Come in and give us your suggestions, look us over and enjoy a smoke on us. You'll always be welcome from six in the morning until six at night.

Since then subsequent bulletins have been issued—all dealing with some phase of association work that is thought will benefit the contractor or on some activity on the part of the association that would build good will with the contractors.

A line of credit has been established with one of the local banks which caters a great deal to the building material field. This line was guaranteed by the directors of the association and was necessitated by the fact that no dues were charged for entrance to the association. Working funds were needed to set up the office and to pay members on sales when collections are slow. As the association has obligated itself to pay 88 per cent of the net sales on the 15th of each month it can be seen that with collections as slow as they are at the present time a good line of credit is quite an asset. The fact that they can count on receiving 88 per cent on the 15th of every month is quite a boon to the members and has relieved them of money worries.

As at the outset many of the orders are first phoned to individual plants by contractors. One thing that has caused this to a great extent is the fact that the association telephone number is not as yet listed in the local phone book, a new book just having come from the press at the time the association was started. To get this number before the contractors, pencils with the phone number and address of the association have been distributed widely to contractors. Every invoice and receipt sent out of the office contains a blotter giving the phone number and address also. Advertising is carried in two local papers catering to the building field.

CONCRETE BLOCK

MILWAUKEE CONCRETE PRODUCTS
CO-OPERATIVE ASSOCIATION
87 - 27th Street
Phone—West 8490
Hours—6 A. M. to 6 P. M.
For prompt service place all orders through this office

Association advertising in "The Daily Western Builder," a trade paper going to those interested in building

The offices of the association are open from six in the morning until six at night. These hours will probably be modified somewhat during the winter months, but during the construction season it is the wish of the members to have the offices open during these hours.

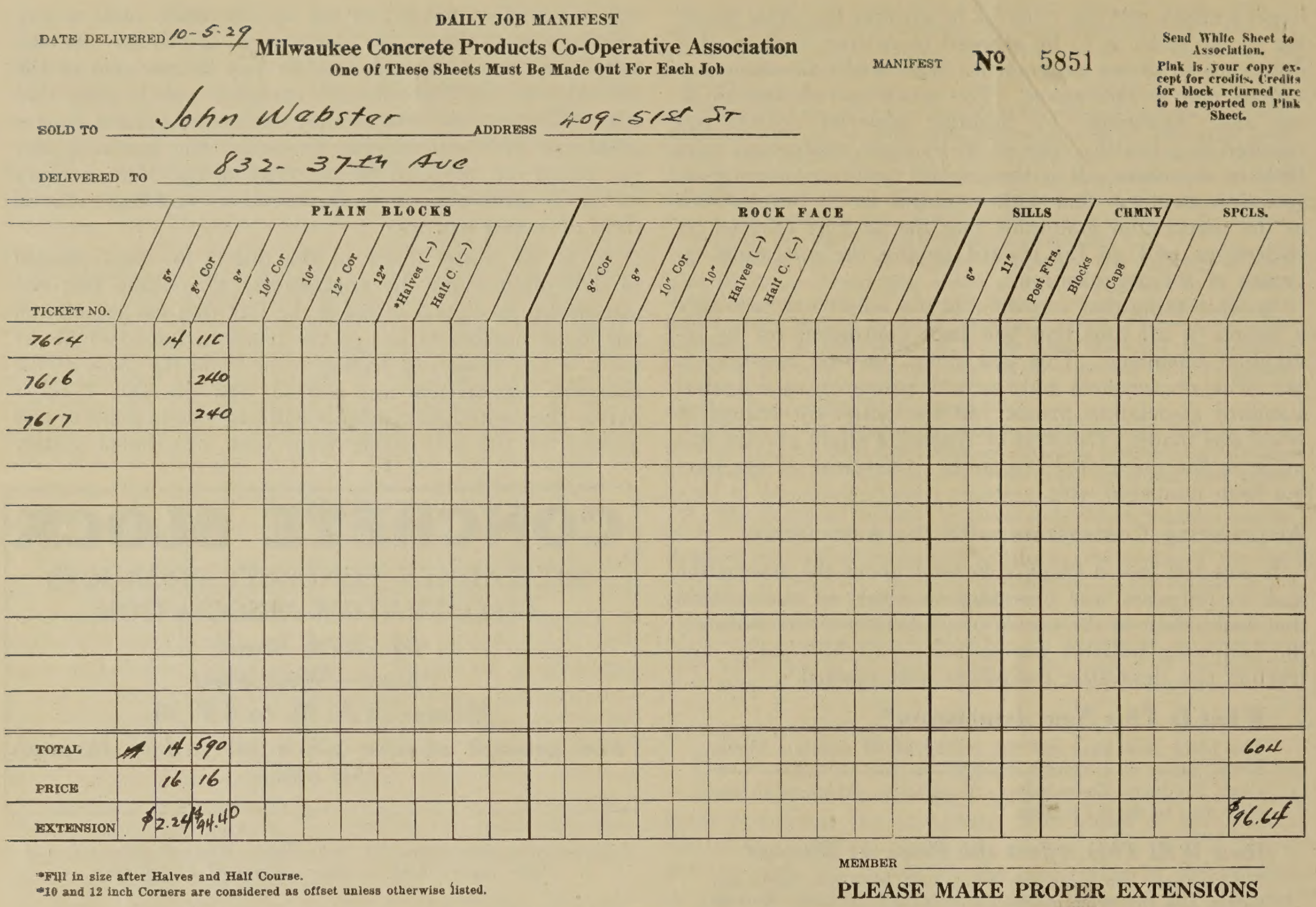
Daily Manifest Sheet

Probably the heart of the entire system of handling sales is the daily manifest sheet. One of these sheets must be turned in daily for each job delivered. It is from these sheets that the records of the association are kept and the billing done. These sheets are made in duplicate so that the member may keep a copy for his records. Attached to each sheet, as they come into the office are the signed delivery slips used in making the delivery. As no billing can be done or no records can be completed without these sheets it can be seen what an important part they play in the life of the association. In making up the pads of manifest sheets the copy for the member was printed on pink paper—the original being white. Where credits are being made the member sends through the pink sheet, retaining the white for his files. This, it was thought, was a simple manner of separating charges and credits.

Invoices are posted daily from these sheets, so that when the end of the month comes they can be quickly completed, statements made out and put in the mail.

Quality Controlled by the Association

As the association has control over the quality of the product manufactured by its members it is making an in-



DAILY JOB MANIFEST

DATE DELIVERED 10-5-29

Milwaukee Concrete Products Co-Operative Association

One Of These Sheets Must Be Made Out For Each Job

MANIFEST **№** 5851

Send White Sheet to Association.

Pink is your copy except for credits. Credits for block returned are to be reported on Pink Sheet.

SOLD TO John Webster ADDRESS 409-51st St

DELIVERED TO 832-37th Ave

	PLAIN BLOCKS											ROCK FACE											SILLS			CHMNY		SPCLS.			
TICKET NO.	5"	8" Cor	8"	10" Cor	10"	12" Cor	12"	*Halves (—)	Half C. (—)				8" Cor	8"	10" Cor	10"	Halves (—)	Half C. (—)					6"	11"	Post Ftrs.	Blocks	Caps				
7614		14	110																												
7616			240																												
7617			240																												
TOTAL		14	590																												604
PRICE		16	16																												
EXTENSION		$2.24	$94.40																												$96.64

***Fill in size after Halves and Half Course.**

***10 and 12 inch Corners are considered as offset unless otherwise listed.**

MEMBER

PLEASE MAKE PROPER EXTENSIONS

A typical manifest sheet—the heart of the system. On the correctness and promptness with which these are filled out depends the success of association office routine

tensive effort to see that all building code requirements are strictly complied with. Previous to their entrance into the association many members had been lax in branding their product. The association quickly instituted a testing and branding campaign and at the present time all member blocks are being branded and their tests have been registered with the local building department as well as the State Industrial Commission. This co-operation with the building department has already resulted in one change being made in the building code that is making daily savings to contractors and the building public. Changes of this sort are quickly brought to the attention of customers and the fact that they were brought about by the association is stressed.

New problems are arising every day in the management of the association just as new problems arise every day in the concrete products business. Milwaukee concrete products manufacturers do not claim to have the panacea for all the ailments of the concrete products business. But they believe they have taken a step in the right direction and that they are in accord with the national trend toward greater co-operative effort in industry and toward co-operative marketing such as advocated by Herbert Hoover in his inaugural address.

Road Association Urges Early Hotel Reservations

Those who plan to attend the Atlantic City road show the week of January 11th are urged by the American Road Builders Association to make reservations for accommodations as early as possible.

Hotels are ready for reservations and requests are to be filed on hotel reservation blanks, the association adds.

As in the past, reduced railroad rates are to be given all members of the American Road Builders Association.

Effect of Improved Methods, Machinery Seen in Rapid Completion of Contracts

The volume of construction job activities during September as measured by shipments of construction material rose twenty points above the previous month although remaining 7 points below the index level for September last year, according to a statistical study just completed by the Associated General Contractors of America.

The maintenance of construction activities during 1929 to a level approximately equal with performance last year checks closely with such employment data as are available. It does not, however, check with the cumulative total of contract awards for the first eight months of this year, which show a decline, according to the F. W. Dodge Corporation figures, of approximately nine per cent.

The maintenance of job activities at rates higher than the volume of contract awards would seem to indicate, is accounted for by the contractors' association through the fact that greater speed is being shown on contracts under way. Because of improved methods, more efficient machinery and higher efficiency of labor, the reserve supply of uncompleted contracts is being eaten into faster than in previous years.

Form Work Details *for* Flush Beam Jobs

Advantages of Flush Beams—Methods Used on a Chicago Job for Detailing and Erecting Flush Beam Forms—Economies Effected

By C. W. ELLSWORTH and H. S. KELLER

THIS article deals with the methods used in designing the form work for flush beams as used on the 2000 Lincoln Park West Building in Chicago from plans by McNally & Quinn, architects, and Smith & Brown, engineers.

The building is wedge shaped, approximately 293 ft. on Lincoln Park West, 319 ft. on Clark Street and 127 ft. on Garfield Avenue. It is 17 stories high, of reinforced concrete with ribbed floor slabs.

The outstanding feature of the building is the use of flush beams throughout, with the exception of spandrels and beams around the various floor openings such as the elevator and stairwells.

Economy of Flush Beams

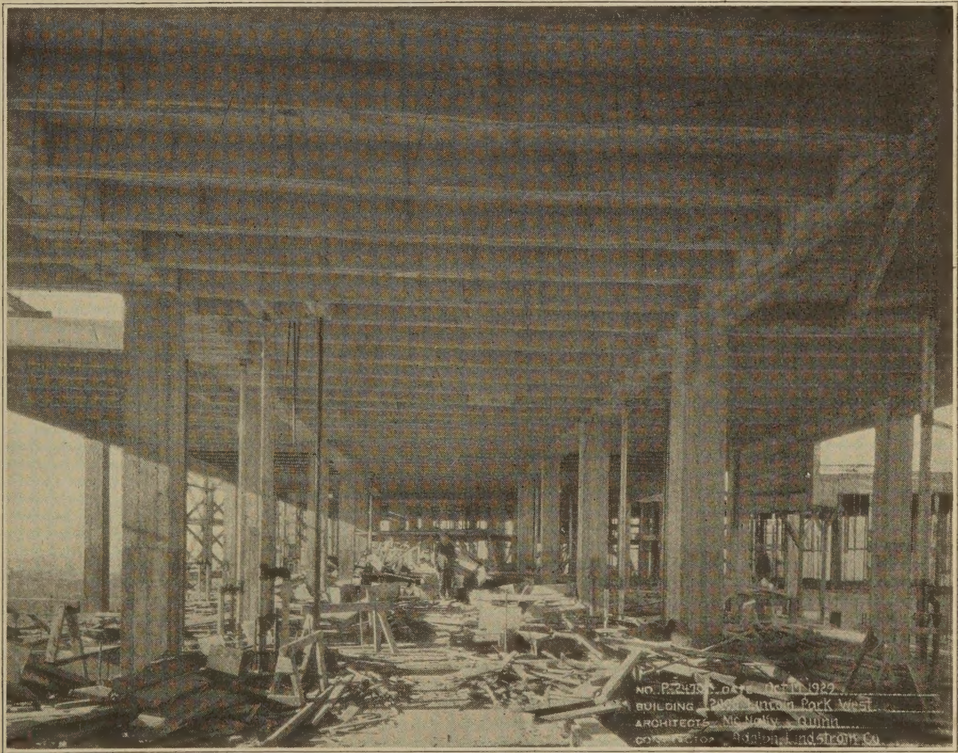
By the term flush beam, we mean that the bottom of the beam is at the same elevation as the bottom of the floor joists. The ribbed floor was 12 in. plus 2½ in., so the beams were 14½ in. deep.

Smith & Brown, the engineers who designed the structural framework of this building, have developed the idea of flush beams to the highest extent. Their value is considerable, both from the standpoint of formwork and other later costs. By referring to Fig. 1, it will be noted that no beam sides had to be made or erected with the method used. The pan side became the beam side.

The cost of the extra amount of reinforcing steel and concrete needed is more than offset by the savings effected. These savings include, for instance, the saving in square yards of plaster, elimination of plaster arises, ease in building up tile walls at any point desired without having beam projecting into room or having to fur with lath the slot left between the wall and the partition if the partition is not directly under the beam.

Shores of Uniform Length

Because all the beams were 14½ in. deep, all the shores were of uniform length. In erecting the forms, the procedure was as follows: First, the shores were erected and 2 by 10 stringers spiked to them. With the exception


NO. P-24[illegible] DATE [illegible] 1929
BUILDING [illegible] Lincoln Park West
ARCHITECTS McNally & Quinn
CONTRACTOR Adolph Lindstrom Co.

One of the floors in the building described, illustrating the use of flush beams of a few bays the joists ran at right angles to the longest side of the building and these joists were carried continuously through all the bays where the joists were parallel. Because of the increased width of the beams resulting from this shallowness, it was found that to build up beam bottoms and erect them in place was a large item in itself. The beam bottoms averaged 24 in. wide.

Where the beam ran at right angles to the joists, a double line of joists and stringers was run from column to column. The space between the joist bottoms or soffit boards was filled up with random lengths of 2-inch boards, as shown on Figure 2. These random lengths were short ends and salvage lumber from the contractor's yard.

Where the beams ran parallel to the joists, it was only necessary to lay in a couple of 2-in. planks.

From the accompanying drawing it will be seen that it was only necessary to get the beam bottoms sufficiently wide.

Pans Provide Beam Side Forms

There were no beam sides as the ends or sides of the pans formed the beam, as the case might be. (See Figure 2.) Wherever a bathroom occurred, a flat slab was formed instead of the joist and slab (to allow for all the plumbing pipes underneath) by running the joists through. All that was necessary then was to form a box which was nailed down to the soffit boards. This did away with the making of a beam side.

Another feature was the elimination of all upturned beams with the exception of two spandrels.

Sectional Outside Beam Forms

The spandrels, of course, were deep beams, but the contractor's (Adolph Lindstrom & Co.) superintendent, O. Peterson, had evolved a system which is much in vogue

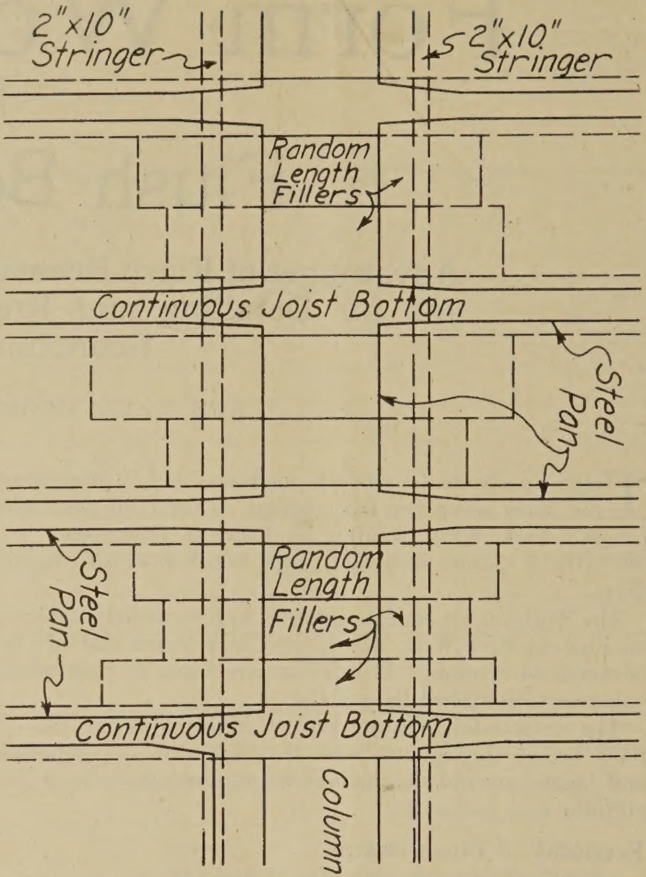
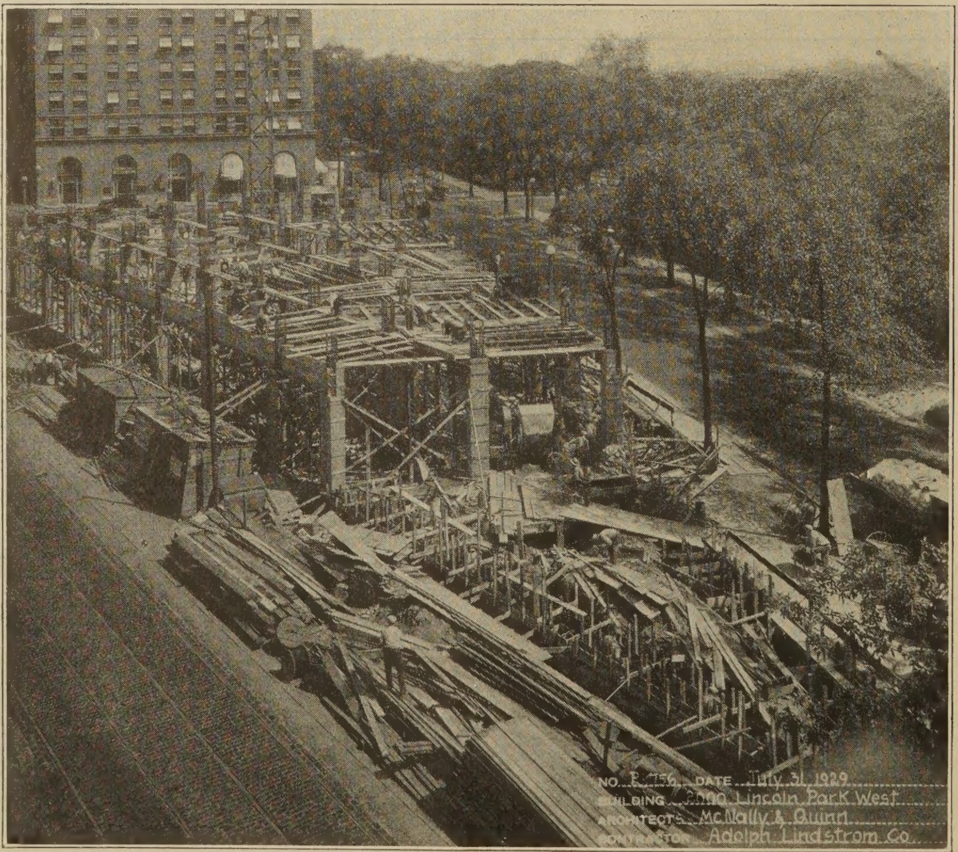


Figure 1. Plan showing method of forming beam bottom of flush bottom beam


NO. E 756 DATE July 31 1929
BUILDING 2000 Lincoln Park West
ARCHITECTS McNally & Quinn
CONTRACTOR Adolph Lindstrom Co.

A progress picture of the job illustrating the form details described now of cutting off the outside column side flush with the bottom of the beam bottom and making up a series of continuous outside beam sides in easily handled sections which were spliced together wherever they were joined. These sections were made up of 7/8th siding nailed to the necessary number of 2 by 4's with a stiffener across the end of the 2 by 4's. When erected, the 2 by 4's were horizontal and the 7/8'ths were vertical. They were about 12 ft. in length and consequently were much easier to handle than regular beam sides, which would have been from 19 to 21 ft. in length. Likewise they were interchangeable, and this also reduced the cost of handling them.

Beam sides 12½ in. or less in height were made from 2-in. material; those over 12½ in. were made of 7/8-in. stuff with battens for stiffening. By using the 2-in. material, a considerable saving was effected over the use of 7/8-in.

While this incident has nothing to do with the formwork, it is interesting. When excavating for footing at the extreme point of the building at the corner of Lincoln Park West and Clark Street, an old sewer system was found beneath the basement floor of the building which was wrecked for 2000 Lincoln Park West. This was the first sewer system in this portion of Chicago before the filling in of the low streets of the city.

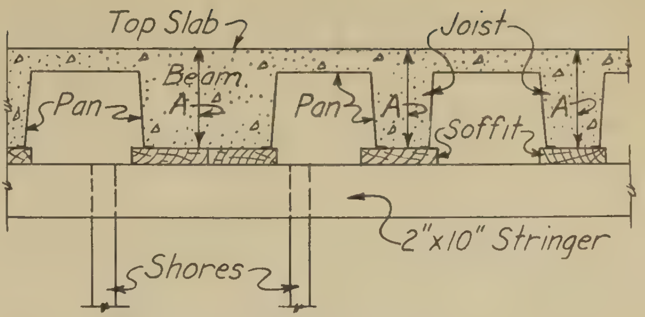
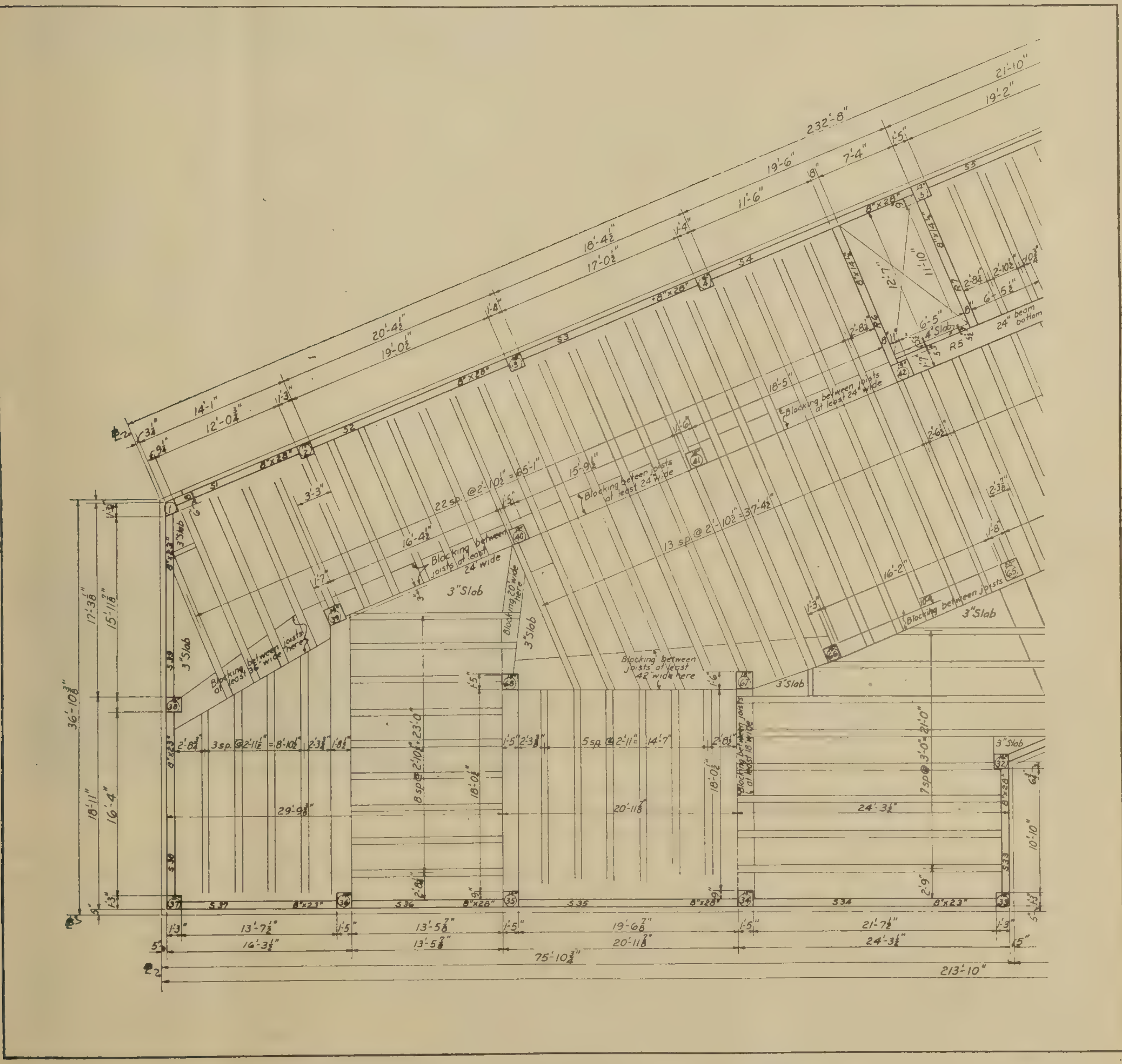


Figure 2. Cross section through slab showing flush bottom beams. A is constant for A_1 beams and joists



A portion of the form detail sheet, showing the method of forming the beams

Testing Concrete-Encased Steel Beams and Girders

Information of far-reaching importance is expected to result from load tests about completed on six full-size floor panels of concrete-encased structural steel, erected for the purpose at the Gary, Indiana, plant of the American Bridge Company. The purpose of the tests is to obtain a comparison between the strength of a structural steel beam considered alone, and the strength of the same beam when encased in concrete.

The tests, which are being conducted under the auspices of the Western Society of Engineers, are sponsored by the Universal Portland Cement Company, the American Steel and Wire Company and the American Bridge Company. The engineering society is represented by members of the structural committee of that organization. The Robert W. Hunt Company is donating its services in connection with test measurements and reports.

In preparation for the tests a floor system of reinforced concrete slabs and structural steel frame was erected in one of the buildings of the American Bridge Company's plant. The floor construction consists of six floor panels, two in one direction and four in the other. The two northerly panels are 20 by 24 ft. in plan; the four remaining panels are 20 by 20 ft.

The floor construction is supported on steel columns, but the columns are not being tested and they are not encased. I-beam girders are framed into the columns, and smaller I-beams frame into the girders at the third-points.

The two northerly panels were concreted with sand-and-cinder concrete, and the remaining panels with sand-and-gravel concrete. In all cases the structural steel members were subjected to load tests and deflection measurements before the panels were concreted; and the same members were again tested after the concrete had hardened for 28 days. While the test reports are not as yet available for publication, observers of the tests have learned that the concrete produces a large increase in the strength of the beams and girders.

The steel reinforcement of the 4-inch concrete slabs consists for the most part of galvanized welded wire mesh. A small area was reinforced with triangle mesh.

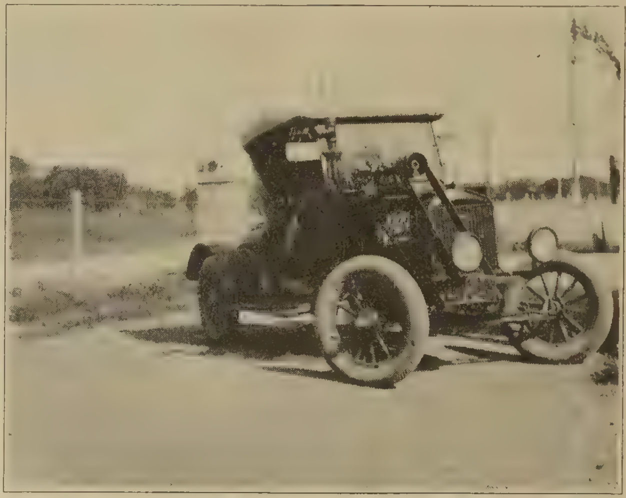
The concreting of the panels was under the supervision of a foreman brought from New York City, because of the desire to follow New York practice in the construction of floors of this type.

The cinder concrete panels were the first to be placed. These panels are of especial interest to the sponsors of the tests, because of the economic possibilities of a low-cost, light-weight floor. Cinder concrete of two different proportions was placed. One mixing proportion used consisted of one part of cement, 2 parts of sand and 5 parts of cinders, with 9 gallons of water to the sack of cement. This mixture produced a slump of about 3 inches. Another mixture consisted of one part of cement, 3 parts of sand and 5 parts of cinders, with 8 gallons of water to the sack of cement. This mixture produced no slump. The concrete was quite dry and had to be tamped into place.

Pump Mounted on Roadster Solves Pacific Coast Irrigation Problem

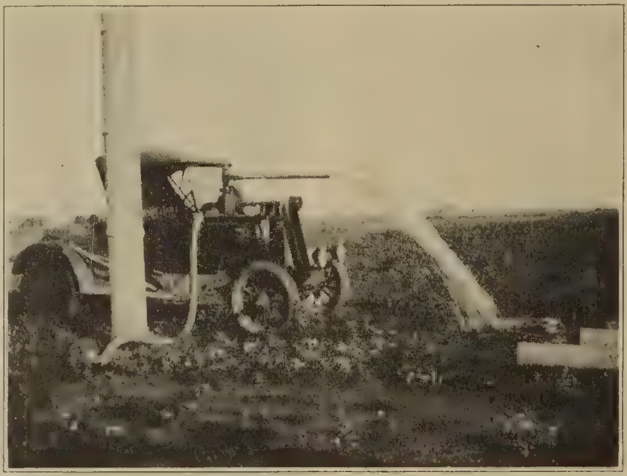
By L. SCHOLTEN

One of the main problems arising in the servicing of irrigations lines is that of pumping out the water standing in the line to be serviced. The problem here is not one of engineering, but of economy, since it involves equipment that is used only occasionally—and then always in a hurry. It is obvious that any elaborate equipment would be a liability, while something too small would mean inefficiency and disgruntled customers. A pump mounted on a trailer is not the best solution, since a car or truck to tow it out to the job may not be always conveniently at hand.



The crank shaft is extended forward to accommodate a pulley, as shown in the illustration above

The Concrete Pressure Pipe & Construction Co. of Gilroy, California, have solved the problem in the following way: Removing the hood from a Ford roadster, they welded a frame of channel iron to the chassis of the roadster, immediately over the motor. The crank shaft was extended forward long enough to accommodate a pulley. A two-inch open runner centrifugal pump was mounted on the frame. A small box body carries all the necessary tools, and an extra length or two of concrete pipe, and thus the pump can go out to the job on its own power. At its destination, the belt is slipped on, and the motor running at idling speed throws a two-inch stream of water eight to ten feet, thus making short work of pumping out any line, however long. An added advantage is that the service car need not be limited to pumping jobs only, but can be used on many small service jobs, regardless of whether or not the pump is needed, thus widening its field of activity, and returning more on its investment. A paraffined cover can be fitted over the pump and motor when not in use. The accompanying photographs give a clearer idea of the outfit.



Showing the pump in operation

EDITORIAL

Cement Testing

TODAY, when the subject of revising specifications for portland cement is being considered, testing methods—particularly physical testing methods—deserve careful attention. Until testing methods are standardized to the point where tests made in different laboratories show more concordant results, it will be difficult to determine the desirability of specification revisions with assurance.

Especially when early strengths are considered, is it necessary to enforce testing requirements rigidly. Even slight changes in the requirements for normal consistency, soundness, tension tests, manipulation in making briquettes, temperature in the laboratory, temperature of air and water and degree of humidity in moist closets—all these affect test results to a conspicuous degree at all testing periods and particularly at early periods. Variations in any of these factors may determine the acceptance or rejection of a cement.

One of the proposed changes in cement specifications now before the Committee on Cement of the American Society for Testing Materials provides for a three-day strength requirement of 200 lbs. per sq. in. It is this provision particularly that will be influenced to a great extent by the degree of accuracy with which the physical testing requirements are followed.

It appears that the majority opinion is in favor of the addition of this requirement to the specification for standard portland cement, though much doubt is expressed as to its desirability under the present lack of uniform laboratory procedure.

There can be no question but that the proposed specification for high early strength portland cement (a separate and distinct provision from the standard portland cement specification) will be approved, but the addition of the 3-day requirement to the standard specification might better be deferred until a better concordance of laboratory test results is attained.

Cold Weather Curing

CONCRETE hardens as a result of chemical reactions between the cement and the water. The continuous presence of water ***at favorable temperatures*** is necessary to initiate and to continue these reactions.

Favorable temperatures are those which range from 70 deg. F. to approximately 100 deg. F., though reaction does take place at temperatures lower than 70 degrees.

It has been definitely shown that the hardening process slows down as the temperatures drop below 70 degrees until it ceases almost entirely at near freezing. Especially in the early hardening period is the slowing down effect of lowered temperatures important.

In order to realize the value of the curing process during these critical early days it is absolutely necessary during cold weather to provide temperatures that will permit the concrete to harden. This can be done at small cost by heating the mixing water and the aggregates or by heating the air in an enclosure or by other cold weather concreting methods that have been described in these pages from time to time.

Unless such precautions are followed when temperatures drop to 40 degrees or below, there is danger that the concrete will not harden sufficiently to develop the strengths required during the time allotted. The precautionary measures needed are so simple and so inexpensive that there can be no excuse for failing to employ them.

Co-Operative Selling

THE co-operative selling plan has invaded the concrete products field.

In Milwaukee County, Wisconsin, a co-operative association composed of concrete products manufacturers embracing approximately 90 per cent of the gravel and stone aggregate block production have launched an experiment that well deserves the particular interest of every manufacturer. The details of the organization and plan of operation are described in this issue. The methods used by the association in sales and collections will be published in the near future.

"Spec" Collins, the executive head of the organization, feels that similar conditions to those existing in Milwaukee County before the new plan went into effect can be found in almost any metropolitan area. He feels that the undertaking is still too new for any definite conclusions to be drawn as to whether or not it definitely points "the way out" to products sales difficulties.

Though there are still problems to be ironed out, the association is functioning smoothly in spite of local conditions that have had an adverse effect on construction volume.

The Milwaukee County experiment will be watched with intense interest by products manufacturers throughout the country. The plan has "worked" in other fields; why not in the concrete products field?

P. G. RILEY
President

P. G. RILEY
GENERAL CONTRACTOR

T. G. McGOVERN
General Supt.

~~701 Temple Street Bustown, N. Y.~~

Los Angeles

Dear Mac:

The other day John Brundage and I were having lunch with Hal Smith, a young contractor, who is a member of the Builders' Exchange, where John and I loaf occasionally—and I guess Hal purposely got John and I to arguing. After listening to us a while, he broke in and said, "If you old war-horses will each write me a letter, P. G., giving the contractor's opinion of what's wrong with the manufacturers of equipment and John his opinion of what's wrong with the contractor, I'll put up a prize of a dozen golf balls to go to the winner and the Secretary of the Builders' Exchange will be the judge. The dirt you two sling in these letters should be real pay dirt for me."

Well, Mac, I wrote something like this:

"In my estimation, a lot of the equipment now being made for use in the building industry does not show any marks of intense research work by the manufacturer, with an aim to producing machines that will do a better job with lower upkeep cost, like, for instance, the manufacturers of automobiles have done.

"The big idea some manufacturers have seems to be to design building equipment to meet or beat competition in the way of low price and light weight, and there is so much copying being done in design that the contractor who usually buys in a hurry gets the idea they are all alike and buys the machine he can get at the lowest price, even though there may be considerable difference in the quality of material and the number of hours of labor in these machines.

"Instead of worrying so much about which way competitors are going to jump in the way of price, more time should be spent in seeing what can be designed into equipment, to make it earn more or save more and last longer, regardless of how much the list price will be affected, for no doubt the price would not be prohibitive—as a matter of fact, the better the machine, the cheaper it is, no matter if the first price is more.

"Why bother with just 'get by' stuff? Results should determine values.

"The contractor and the maker of the machinery the contractor uses should be shooting at the same mark and that mark should be 'Saving'—not in buying or selling price, but in ultimate costs and if they don't keep their eyes upon the ball of 'Saving,' they will drift into habits not good for their game.

"The manufacturer causes the salesmen to say, 'The power of this machine is the same as'—'This part is the same as'—and 'That part is the same as'—and point to some 'doo dads' placed on the machine as sales closers but, Ye Gods, why don't somebody get out of step and make machines that will be like the proverbial mouse trap, which caused so many paths to be worn to the door of its maker.

"Service is more than skin deep—it's got to be built into a machine before it can be taken out. Aladdin was a lucky cuss—he got service by just rubbing his lamp—and the manufacturer who builds a machine that a contractor can, by just rubbing grease on it, get service uninterrupted by break-downs, will be a lucky cuss, too.

"Any manufacturer of contractors' equipment can build machines which will produce service almost equal to that produced by the Genus of the Lamp, if they will work for it, unhampered by price, which, after all, is but a mental hazard."

John Brundage thinks contractors beat down quality by beating down price, so it's a good thing he doesn't know what I am writing.

PG

P. G. Riley is a former contractor spending his days of retirement under California's sunny skies. Mentally, however, he is almost as much "in the game" as he ever was.

Perhaps his greatest pleasure is in keeping touch with his superintendent, Tom McGovern, and, off and on, his secretary, Anna Ryan. His being away from the scene of activity has given P. G. some new viewpoints and he manages, in his letters, to convey to the young folks some of the ideas in the back of his head. One of the bits of advice he has already given "Mac" concerned the wisdom of investigating operating performance when buying equipment. At another time he told Mac of the "catch" in the seemingly attractive trade-in offer. There's a lesson, too, he said recently, in not letting old, inefficient equipment eat up the profits.

In another recent letter "P. G." passed on to Mac a little incident he had heard about, to the effect that horse trading tactics in equipment buying are not the best way of doing business.

Repairing Floor Finish

Causes of Defects—Correct Methods for Making Repairs —Field Offers Opportunity for Winter Contracting Work

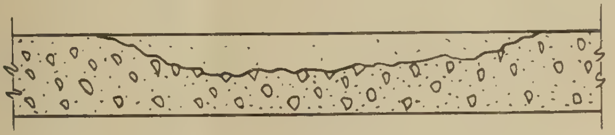
CONCRETE floor finishes, when improperly constructed or when misused in service, may develop defects that should be promptly repaired. Defects can usually be traced to the failure to observe the basic facts governing the making, placing, curing and finishing the concrete. Subjecting a floor finish to heavier or rougher service than designed for will often cause dusting or cracking. Repairing defective finishes, being inside work, affords the concrete contractor a means of keeping his crew busy during the winter months.

How to Repair Cracking

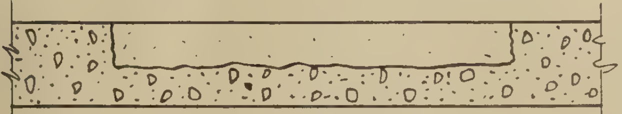
Cracks in concrete floor finishes may be classified under two headings: (1) Cracks originating in the base and extending through the finish. These are commonly known as structural cracks. (2) Cracks confined to the finish layer. These may be further divided into (a) cracks extending through the full thickness of the topping, and (b) those of a superficial nature, ordinarily called hair cracks, or crazing.

Cracks of whatever origin are difficult to repair. If they develop in areas of any size, or become too evident over the whole floor surface, the more economical method of repairing is to remove the entire affected area by chipping, to the depth of at least one inch. A new wearing surface should be applied under the specifications for "One-Inch Bonded Topping" given at the end of this article.

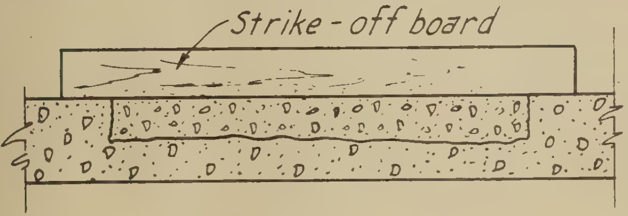
Sketches showing correct and incorrect methods of repairing concrete floor finishes



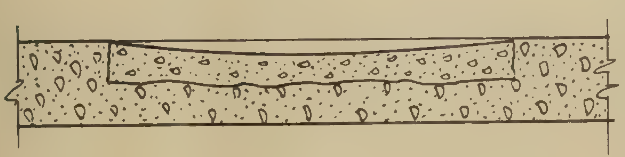
Incorrectly installed patch. Patches installed with feathered edges will soon break down under trucking.



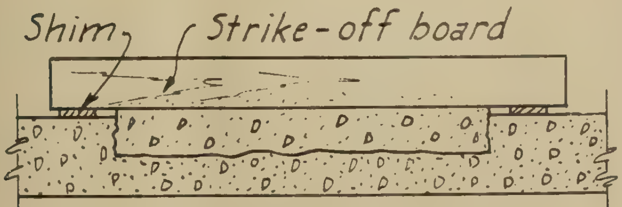
Correctly installed floor patch. The chipped-out area should be at least one inch in depth with the edges perpendicular.



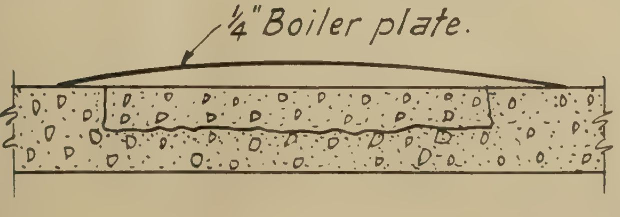
Incorrect screeding of patch. The patch should not be struck off to the level of the floor.



Results of incorrect screeding of patch. When a patch is originally struck off to the level of the floor, the concrete will sag in the center, due to the fact that the straight-edge has a tendency to cut off slightly below its lower edge and to the fact that the concrete shrinks during hardening. Additional concrete placed in the concave area will soon chip out under traffic.



Correct method of screeding patch. The strike-off board is held slightly above the level of the floor by strips or shims laid the length of the patch on two sides. For large patches the thickness of these strips will be greater than for small patches. The concrete is allowed to rest for 1 or 2 hrs. This allows the concrete to attain some of its initial shrinkage before being troweled to its final plane and will result in a uniformly level surface, plane with the rest of the floor.



Protection of patches. Patches should be kept wet continuously and protected from traffic for a period of 10 days. An economical method of protection consists in using a piece of ¼-in. steel boiler plate bent as shown and placed over the patch to take traffic during the curing and hardening period.

Chipping off defective topping should be carefully done with pneumatic tools or by hand, and the entire area should be removed until clean, sound concrete is exposed. In no case should the depth be less than one inch. Feathered edges should be avoided and the full depth of the chipped area should be maintained up to the point where it joins with the sound topping. The accompanying figures illustrate correct and incorrect methods of patching defective floors.

Regardless of the nature of defective floor finishes, whether soft spots, dusting or cracks, there is no method of repair as effective as careful patching by chipping away the defective areas and replacing the topping with properly designed concrete placed and finished under satisfactory specification and capable supervision.

Patches should be protected against too early use until they have been thoroughly hardened and cured.

How to Correct Dusting

It is often advisable to use a chemical hardner treatment on the surface of the floor to eliminate dusting. These treatments improve the surfaces, but they will not make the wearing qualities of a poorly built floor perfect. Such treatments are not cure-alls for poor workmanship or careless practice.

Surface hardners using such substances as magnesium fluosilicate, sodium silicate, aluminum sulphate, zinc sulphate and various oils, gums, resins and paraffins tend to fill the pores in the finish and produce a more dense topping either by crystallizing or acting as a glue.

Fluosilicate Treatment

The fluosilicates of zinc and magnesium, when dissolved in water, have been used with success for hardening defective concrete finish. In making up the solution, ½ pound of the fluosilicate should be dissolved in one gallon of water for the first application and 2 pounds to each gallon for subsequent applications. The concrete floor must be clean and free from plaster, oil, paint or other foreign substances, otherwise the solutions will not penetrate sufficiently to react. For the same reason the surface must be absolutely dry. After the floor has dried, the second application may be made. About 3 or 4 hours are generally required for absorption, reaction and drying, though this will depend upon the weather. In this treatment, with the average floor surface, one gallon of the liquid will cover approximately 130 square feet. Care should be taken to mop the floor shortly after drying to remove incrusted salts, otherwise white stains may be found.

Sodium Silicate Treatment

When sodium silicate is used, it is applied in a 20 per cent solution in two or more coats 24 hours apart. Ordinarily the sodium silicate requires considerable time to dry before the floor can be used. Commercial sodium silicate varies in strength from 30 to 40 per cent solution. It is quite viscous and requires thinning with water before it will penetrate the floor. It has been found satisfactory to dilute each gallon of the silicate with three gallons of water. Each gallon of the resulting solution will cover approximately 200 square feet of floor surface. The floor should be thoroughly cleaned of all foreign matter, and should be dry before the first application of the silicate solution.

Aluminum Sulphate Treatment

This treatment consists of one or more applications of solutions of aluminum sulphate to the clean, dry surface. The solution is made up in a wooden barrel or stoneware vessel and the water should be acidulated with not more than one teaspoonful of commercial sulphuric acid for each gallon of water. The sulphate does not readily dissolve and requires occasional stirring for a few days until the solution is complete. About 2½ pounds of the powdered sulphate will be required for each gallon of water and one gallon of the solution should cover about 100 square feet of floor surface. For the first treatment the solution may be diluted with twice its volume of water. Twenty-four hours after this application the stronger solution may be used, and twenty-four hours should elapse between subsequent applications.

Zinc Sulphate Treatment

This treatment consists of the application of about 16 per cent solution of zinc sulphate made acid with a teaspoonful of commercial sulphuric acid to every gallon. The mixture is applied in two coats, the second coat being applied four hours after the first. The surface should be scrubbed with hot water and mopped dry just before the application of the second coat. This treatment gives the floor a darker appearance.

Specifications for One-Inch Bonded Topping

The following specification is adaptable to both the original construction of a heavy duty floor finish, and to repairs when made by chipping away the defective area and replacing with a new finish course.

This specification is for one-inch concrete topping placed after the concrete base has hardened.

Base Slab—The surface of the structural base slab shall be finished reasonably true and struck off at a level approximately one inch below the required finish grade.

As soon as the condition of the concrete base permits, and before it has fully hardened, all dirt, laitance and loose aggregate shall be removed from the surface by means of a wire broom, which shall leave the coarse aggregate slightly exposed, or the surface otherwise roughened to improve bond with the topping.

When it is impossible to remove laitance and roughen the slab by brooming, the surface shall be cleaned and prepared for bond by chipping after the base has hardened.

Just prior to placing the finish, the base slab shall be thoroughly cleaned by scrubbing.

Aggregates—Both fine and coarse aggregates shall be used in the finish. Fine aggregate shall consist of clean, hard sand or crushed stone screenings free from dust, clay, loam or vegetable matter. All particles shall pass a ¼-inch sieve and shall be graded from fine to coarse with the coarse particles predominating. Not more than 5 per cent shall pass a 100 mesh, and not more than 10 per cent shall pass a 50 mesh sieve.

Coarse aggregate shall consist of clean, hard pea gravel, or crushed stone, free from dust, clay, loam or vegetable matter and from coatings which will tend to weaken the bond. It shall contain no soft, flat or elongated fragments, and shall be graded from ¼ to ⅜ inch; all particles shall pass a ½-inch mesh. All aggregate shall be selected with care.

Mixture—The mixture shall be 1 part portland cement, 1 part of fine aggregate and 2 parts of coarse aggregate by volume. This nominal mix may be slightly varied, depending upon the local conditions. If the aggregate is very coarse, the gravel or stone should be reduced to 1½ parts. In no case shall the volume of the coarse material be more than twice the volume of the fine.

Not more than 5 gallons of mixing water, including the moisture in the aggregate, shall be used for each sack of portland cement in the mixture.

Consistency—The concrete shall be of the driest consistency possible to work the strike-off board or straightedge with a sawing motion.

Changes in consistency shall be obtained by adjusting the proportions of fine and coarse aggregate within the limits specified. In no case shall the specified amount of mixing water be exceeded.

Placing and Compacting—The base slab shall be thoroughly wetted just prior to placing the finish, but there shall be no pools of water left standing on the wetted surface. A thin coat of neat cement grout shall be broomed into the surface of the slab for a short distance ahead of the topping. The wearing course shall be immediately applied before the grout has hardened, and brought to the established grade with a straightedge.

Finishing by Troweling—After striking off the wearing course to the established grade, it shall be compacted with a wood float. The surface shall be tested with a straightedge to detect high and low spots which shall be eliminated. Floating shall be followed by steel troweling after the concrete has hardened sufficiently to prevent excess fine material from working to the surface. The finish shall be brought to a smooth surface free from defects and blemishes. No dry cement or a mixture of dry cement and sand shall be sprinkled directly on the surface of the wearing course to absorb moisture or to stiffen the mix. After the concrete has further hardened additional troweling may be required.

Curing and Protection—All freshly placed concrete shall be protected from the elements and from all defacement due to building operations. The contractor shall provide and use when necessary tarpaulins to completely cover or enclose all freshly finished concrete.

If at any time during progress of the work the temperature is or will drop below 40 degrees Fahrenheit, within 24 hours, the water and aggregate shall be heated and precautions taken to protect the work from freezing for at least five days.

As soon as the concrete has hardened to prevent damage thereby, it shall be covered with at least one inch of wet sand, or other satisfactory covering, and shall be kept continuously wet by sprinkling with water for at least ten days.

New Decision Upholds Validity of Straub Patent

The latest decision maintaining the validity of the Straub patent is that of September 9, 1929, by Judge Dickinson in the Federal district court at Philadelphia, Pennsylvania. The suit was entitled Crozier-Straub, Inc., vs. Wm. Reiter.

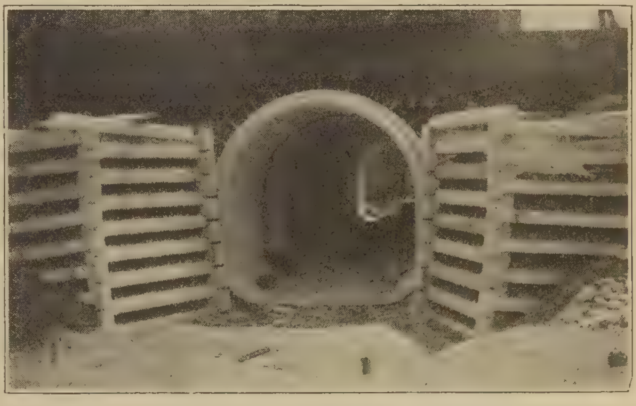
The latter, it appeared on trial, separated the cinders by screening out all coarse lumps and used only "fines." He also used slag with the cinders, varying from two-thirds slag and one-third cinders to one-third slag and two-thirds cinders, it is said.

The decision, in part, reads as follows:

> This patent was issued in 1917. Nearly three-fourths of its expectation of life has gone. The wisdom of subjecting the validity of an issued patent to the test of judicial inquiry would not be questioned, and of course a finding of infringement against one defendant, even if quadrupled, does not conclude another use. None the less, there comes a time when, if a patent is to have any value, it should confer a recognized right. There are cases undoubtedly in which the remedy of a claim for damages is practically adequate, but after the validity of a patent had been four times judicially determined, and the test of infringement has been applied in four different cases, the owner of the patent should not be left to the ferretting out of trespassers upon his rights who are hard to find and difficult to hold and to a claim for damages which may never be fruitful. Infringement should stop. As we view it, this cause presents a clear duty to a trial court. The question of validity is foreclosed by the rulings made and the question of infringement likewise, unless the case of the instant defendant can be differentiated in principle from those of the other users who have been found to be infringers.
>
> This finding we cannot make and hence view this case as one to be ruled upon the authority of Crozier-Straub vs. Graham.
>
> It would in consequence be idle in us to enter upon the discussion to which we are invited by the argument presented to us. It is often true when any invention obtrudes itself upon an established trade, and more truly upon an art which is in the development stage, that those who have followed the art face a dilemma. The whole trade must pay tribute to the inventor or the business be abandoned by those engaged in it. This, if an evil, is an unavoidable one. If the invention has revolutionized the trade, this is the highest tribute which can be paid it. If it has not, then those engaged in it are free to do what they have before done, but they may not do what the invention has first taught the trade to do. Building blocks were made before Straub and undoubtedly those who made them may continue to so do as may likewise all those who may wish to enter the trade. The Straub cinder block has, however, been found to be a new thing, brought to light by Straub, and for which he has been given the monopoly created by law in its manufacture, use and sale.
>
> A verbal definition of that which thus exclusively belongs to him and from the manufacture, use and sale of which others must abstain may be difficult to frame, but it is worthy of comment that in the first case presented to the Circuit Court of Appeals there was no evidence of the trade recognition given to the Straub block, but there was in the ruling a striking prophetic forecast of the welcome which the evidence in the later cases showed had been extended to Straub's contribution to the art. There is no surer test of the fact of invention and the invention's claim to merit than the reception given it by the trade concerned, just as the fact of infringement and the number of infringers is the highest tribute which can be paid to the utility of what is invented.

Reinforced Concrete Pipe Used for Pedestrian Tunnel

Reinforced concrete pipe was employed in an unusual way recently when the New York, New Haven & Hartford Railroad built a pedestrian tunnel under a siding at Shelton, Connecticut. This siding was often blocked by freight cars when employees of factories located on opposite sides of the tracks desired to cross, especially at the end of the day's work. The town of Shelton requested the railroad to provide an underpass for the convenience and safety of the factory workers and others who had to cross the siding several times daily.



Eighty-four-inch reinforced concrete pipe was used to build the pedestrian tunnel. This underpass was built quickly and economically. The tunnel is 30 ft. long, and the embankment is supported on each side by concrete crib-work.

While pedestrian tunnels have been very successful in large cities, especially in Los Angeles where approximately 45 have been built of reinforced concrete, the underpass at Shelton is believed to be the first one constructed of concrete pipe.

To Sell Service and Publish Prices Dominant Notes of Steel Fabricators' Meeting

"THE Federal Trade Commission, through approving the open publication and circulation of prices to the trade and in approving a single closed bid, has paved the way for the elimination of the Oriental method of individual barter and haphazard dickering in individual transactions." This statement by Arthur Fisher of Chicago at the semi-annual meeting of the Concrete Reinforcing Steel Institute, held September 30th to October 2nd, at Wawasee, Indiana, opened the discussion of methods by which conditions in the reinforcing steel industry might be radically improved.

Another forceful speaker was Edward L. Ryerson, Jr., president of Joseph T. Ryerson & Son, Inc., who pleaded with the fabricators to "sell service" instead of indulging in cut-throat competition.

Harvey Wiley Corbett of New York City, perhaps the foremost architect in the United States in the modernistic field, paused during his address on "The Meaning of Modernism" to remind his audience that the American Institute of Architects, by the adoption of and adherence to a fixed schedule of commissions, had placed the profession on a high ethical basis. "Steel fabricators should likewise adhere to published prices and sell service," he said.

C. Louis Meyer, president of the institute, reviewed present-day conditions in the industry in his semi-annual address. He said, in part:

"The Concrete Reinforcing Steel Institute should stand for a quality product and for superior service. The specification for intermediate grade billet steel is the specification of a quality product. We should encourage the building industry to accept this material as the best product which the steel industry can manufacture, as the best product for use in reinforced concrete. It should be known as the Institute Standard Specification. High standards of shop practice, of fabrication of reinforcing steel—high standards of engineering practice, should be adopted by every member of this institute. With these high standards as to quality of steel and of superior service relating to fabrication and to engineering practice, the building industry will soon accept these standards as their definite requirements. Membership in this institute will then become a thing desired by every member of the industry. Architects and engineers will then specify the products and the service offered by institute members."

Trade Practice Rules

At the Wednesday morning session the institute members listened to a very forceful address under the subject, "The Road to Real Profits," presented by Arthur Fisher of Chicago, a member of the firm of Butler, Lamb, Foster & Pope, legal counsel for the institute.

Mr. Fisher stressed particularly the Trade Practice Conference rules approved by the Federal Trade Commission following the Trade Practice Conference held by the industry at Asheville last April. Mr. Fisher said:

"Under precedents established by Trade Practice Conference rules approved by the Federal Trade Commission in recent months in the case of four important American industries this association of reinforcing steel fabricators and distributors may, in my opinion, now safely require the publication of prices by each of its members. Industries in which rules with reference to the publication of prices have recently been promulgated by the Commission include not only the reinforcing steel industry itself, but also such other groups as petroleum refining and distributing and scrap iron and steel.

"Your industry may also now take the position that any departure from published prices until after those prices have been publicly withdrawn and new prices published and circulated is an unfair and improper trade practice.

"While this trade practice is not to be construed in any sense as justifying any agreements between competitors with reference to uniform prices, the natural effect of the open publication of prices is to stabilize a market on the basis of broader considerations of an economic character, rather than on the basis of individual barter and unrevealed and ill-considered dickering in individual transactions. The open publication and circulation of prices to the entire trade and the public is essential to give real value to cost studies such as those which have been widely encouraged and developed under the leadership of the Department of Commerce during the period of President Hoover's secretaryship. This is particularly true in a building industry where each job is in a sense unique.

" 'Firm bidding' has also now met the endorsement of the Federal Trade Commission and is another step toward the merchandising of reinforcing steel rather than the auctioneering of the product by the lowest bidder. If the industry will throw its weight back of the practice of permitting but a single closed bid, after due consideration of all relevant costs and other factors, on any one job by any one firm, the American method of selling will have replaced the Oriental in your industry. The Commission has also given its stamp of endorsement to this procedure and its enforcement, at least in part on the ground that a practice which is a requirement of Government contracts is not improper in private business.

"In order to complete the structure of intelligent rather than haphazard merchandising it is, finally, necessary to require where several items of a different character are included in a single lump sum bid that each item be quoted separately, and that the bid and the contract show on their faces the application of the published price to the unit price of the commodity. This requirement in all contracts for reinforcing steel has also met with Government endorsement as the approved practice of the reinforcing steel fabricating and distributing industry."

Other Speakers

James F. Curley, vice-president of the Concrete Steel Company, New York City, gave an interesting paper on "Inspection of Reinforcing Steel." Charles M. Gunn, president of Gunn Carle & Company, San Francisco, presented a survey on the subject, "Pacific Coast Market Conditions." Louis Aronstam, president of the Southern G-F Company of Atlanta, presented a very forceful picture of future possibilities in the field of concrete joist construction.

Reports were received and discussed covering the following committees: Market Extension, Credit Information, Membership, Publicity, Warehouse Operation, Costs, Standard Practice, Engineering Practice and Grade of Steel.

Assistant Engineer Appointed

President Meyer announced the appointment of J. P. Thompson as assistant engineer for the institute, to take effect immediately. Mr. Thompson was formerly employed by the Portland Cement Association. The institute will place Mr. Thompson in offices to be opened in New York City and his promotional activities will include the entire east coast.

Cold Weather Curing

of Concrete Products

Improved by Simple Drying Device

Home-Made Arrangement Supplies Warm, Dry Air to Kilns After Steam Curing Period to Hasten Drying-Out During Cold Weather

THE Sheboygan Brick Co., Sheboygan, Wis., manufactures concrete brick and sells them in connection with clay face brick and other permanent building materials, such as coal chutes, flue doors, etc. As the volume of sales of concrete brick increased, the manufacturing season was lengthened to include the cold weather periods of late fall and early spring, and it is the solution of the problem of satisfactory curing during cold weather which presented itself then that is described in this article.

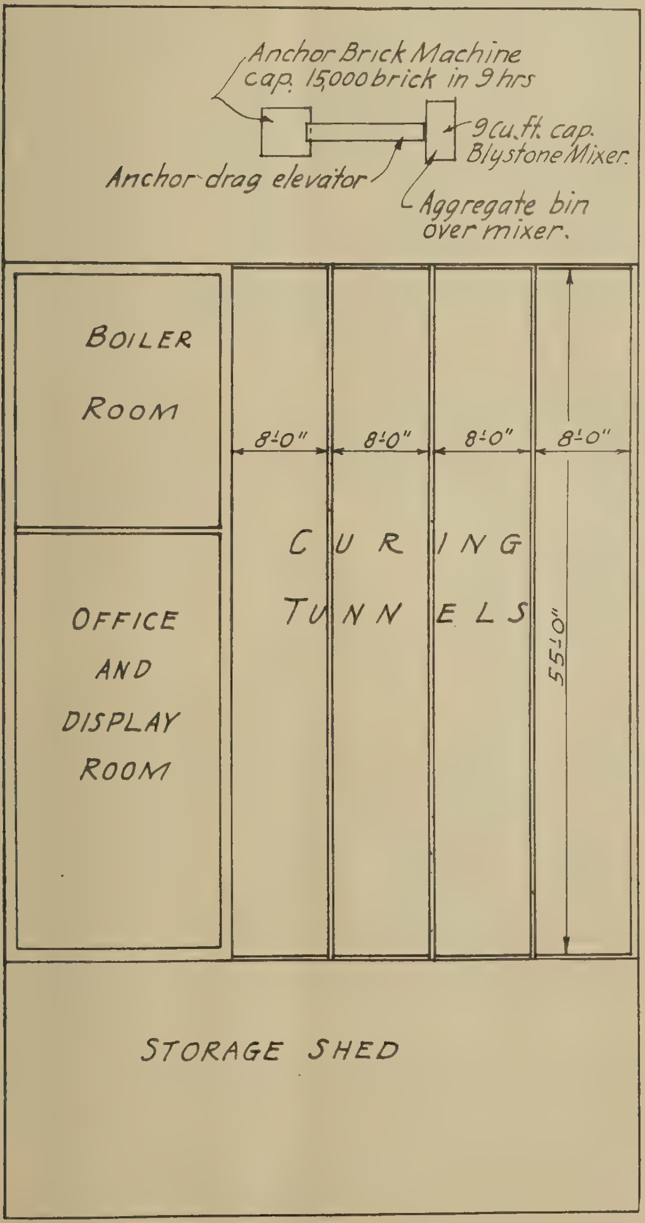


Figure 1

Plant Layout

An accompanying sketch, Figure 1, shows the layout of the plant. It is divided roughly into three sections: The manufacturing section, the curing rooms and the storage room. Aggregates are stored in an overhead bin over the 9 cu. ft. Blystone mixer. The concrete is taken from the mixer to the Anchor brick machine by means of an Anchor drag elevator. The brick are placed on self-stacking wood pallets which are taken to the curing rooms by means of a Shope gig. A tier of stacked brick, approximately 5 ft. high, is taken at each trip. After the brick are cured, they are taken out of the other end of the kilns and piled in the storage room.

There are four curing tunnels, each approximately 55 ft. long and 8 ft. wide. The roofs of the tunnels are sloped so that one side is 6 ft. 9 in. high and the other side 6 ft. high. Wooden doors that open outward are placed at each end of the tunnels.

Curing Difficulties

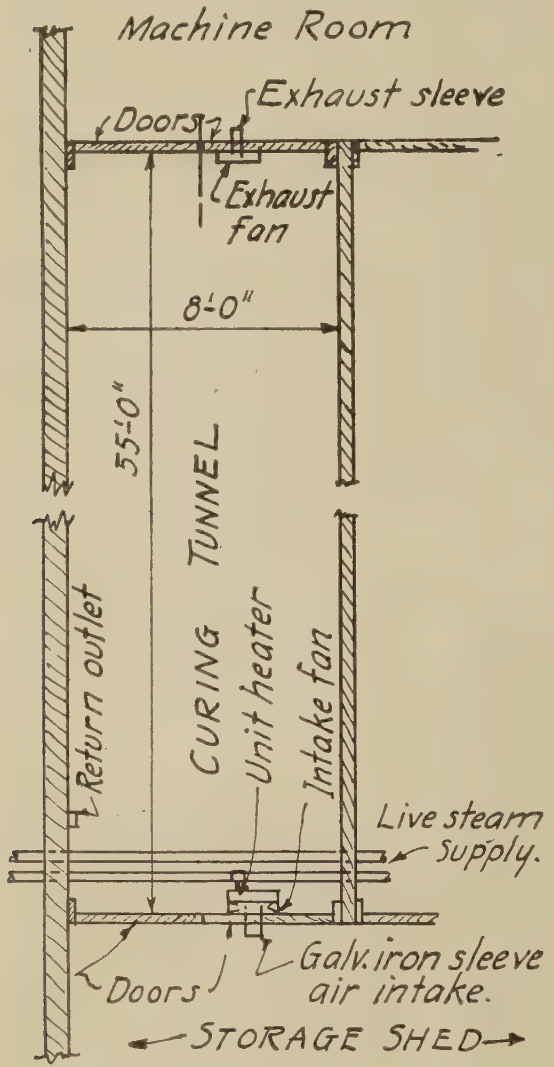
The brick are steam cured in the tunnel for 48 hours, after which they are removed to the storage room. Under ordinary summer conditions the brick will dry out satisfactorily in the storage room, but when the outside temperature drops to 50 degrees or lower, the brick will not dry out sufficiently to permit placing them in the wall.

Even though the brick appeared to be dry, it was shown that they dried out only to a depth of approximately half an inch, leaving the inside of the brick moist. If such brick are laid in a wall, a period of dry weather will cause them to shrink, resulting in cracks. Usually the cracks formed are not along the mortar joint, but through the units themselves. Mason contractors found difficulty in handling the brick under such conditions and demanded that they be delivered on the job as dry as clay brick. A particularly large job coming up late in the fall necessitated the immediate installation of some method of drying the brick during the colder weather that then prevailed.

A Home Made Drying Device

The first attempt to dry the brick after the 48-hour steam curing period was by means of a fan placed at one end of the kilns. The fan was mounted on a rack about 5 ft. from the floor. The rack was completely encased, an opening being so arranged that the air supply was taken from a point about 15 in. above the floor. By means of the steam coils already installed in the tunnels, the temperature in the kilns was raised to approximately 75 deg. and the fan was turned on. While this method was partially successful, it did not produce the results expected and a new method had to be devised to function satisfactorily under full production.

After considerable investigation into heating and ventilating problems, it was decided to make use of the so-called "unit heater" and to adapt it to the problems presented. A unit heater is similar to an automobile radiator in appearance. It has a tier of copper steam tubes running in a horizontal direction. Around each copper tube a helical brass fin is wound which increases the heat radiating surface about 300 per cent. The unit selected for use is about 30 in. square and about 10 in. thick. It is capable of delivering 500 sq. ft. of radiation. Calculations made on the basis of tunnels of the size used indicate that, with an outside temperature of zero degrees, 125 sq. ft. of radiation would be required to bring the tunnel temperature to 75 deg. and to effect the evaporation necessary to rid the brick of the moisture.



DETAIL OF HEATER INSTALLATION IN TYPICAL KILN

Figure 2

How the Heater is Installed

An accompanying diagram (Figure 2) illustrates the manner in which the unit heater was used. The heater was mounted on a portable chassis and the fan that had previously been used was mounted on the same chassis directly in front of the heater as shown. A housing, encasing both the fan and the unit heater, was constructed.

The unit was then placed inside the tunnel directly against the door. The air supply was taken from the storage room through a 12-in. galvanized iron sleeve which extended from the fan housing through a hole in the tunnel door into the storage shed.

Live steam was taken from pipes that were placed through the kilns, connections being provided in each kiln for the lead to the unit heater. Condensation from the heater was drained into a return outlet placed in the floor of the tunnel.

The fresh air was then drawn from the storage room, forced through the unit heater and into the kilns. On the other end of the tunnel an air duct was provided and another portable fan was provided to draw the warm air from the tunnels into the shop. In this manner the waste heat was utilized to warm the room in which the units were being made. The fans and the unit heater, being portable, were moved from kiln to kiln as the brick completed the steam curing period.

The entire installation, including the placing of the steam line to feed the unit heater, cost under $200. The equipment has been operating for two winters and has given very satisfactory results. The only item that is not entirely satisfactory is the height of the tunnels. Because the stacked tiers of brick are only about 5 ft. high, there are about 2 ft. of waste space above them for which heat is required. At present this objection is being met by stretching a canvas over the brick after the tunnels are filled and keeping as much of the heat as possible under the canvas. It is the intention of Mr. Grube, who operates the plant, to replace the curing tunnel roofs and when this is done, they will be lowered about 2 ft.

Brick that are steam cured for 48 hours and then kept under the warm air draught for 24 hours with the present equipment are as dry as those which are taken out of the storage shed during the summer. By means of this installation shrinkage in walls has been practically eliminated and the objections of the mason contractors have been completely overcome. The result is a longer operating season and increased output at a very slight additional cost.

New Orleans 1930 Convention City for A. C. I.

The 1930 convention of the American Concrete Institute will be held at New Orleans, Louisiana, on February 11th, 12th and 13th. It is believed that a very much interested Southern membership, holding promise of thorough co-operation, warrants the choice of New Orleans.

Institute headquarters will be established at the Roosevelt hotel. John Porter, chairman of the sewerage and water board of New Orleans has been made chairman of the Institute convention committee for local arrangements and co-operation.

Recent A. C. I. conventions have drawn 75 per cent of their attendance from within 250 miles of the convention city. In going to New Orleans the Institute is jumping over considerable territory in which membership is more thinly scattered than in the northern tier of states. It will thus be a longer jump for more members of the Institute than it has been to other Institute conventions.

Of the six cities balloted early in 1929 the gulf city ranked first in popularity, with New York, Cleveland, Chicago, Pittsburgh and St. Louis following in the order named.

A Mathematical Method of Proportioning

A New Set of Empirical Equations for Determining the Cement and Water Content of the Mix and the Fineness Modulus of the Mixed Aggregate, Based on the Averages of a Large Number of Tests

By JOSEPH A. KITTS
Consulting Concrete Technologist, Kitts & Tuthill, San Francisco

AGGREGATES, cement and water may be combined in an infinite number of proportions to produce concrete of a like number of consistencies and compressive strengths. We may have any maximum size of aggregate from 0 to 12 inches in diameter, any amount of cement from 0 to 2,538 lbs. per cubic yard, any amount of water from 0 to 20 cubic feet per cubic yard, and any slump from 0 to nearly 12 inches. The aggregates and the cement, while of standard* quality, may be of average commercial quality, below, or above, in strength producing characteristics. With unknown materials, the true quality of the concrete therefrom may be determined only by tests of mixtures in "absolute basis" proportions. However, with average commercial quality normal standard portland cement, average commercial quality standard aggregates, and rigid technological control, we can predict the probable compressive strength of mixtures in fundamental proportions by mathematical interpretation of available research data and experience.

Within practical limits the variation of compressive strength with cement content, water content and size-grading of aggregates, follows simple mathematical laws or empirical equations which may be indicated algebraically or graphically.

"Absolute basis proportions," the mix structure in absolute volumes of cement, mixing water, and of aggregates of various diameters (and in the corresponding weights and loose-measured volumes), depend upon appreciation of certain physical characteristics of the aggregates and cement and the ratios of absolute volumes of each material.

This article will present the complete physico-mathematics of proportioning ¾, 1, 1½, 2 and 3 in. (square hole) maximum size of standard aggregate of average commercial quality with normal standard portland cement for concrete of ¾, 3½, 6½ and 9 in. standard slump and for any compressive strength (within the limitations of these conditions) and for the optimum of economy of cement and of workability and cohesion of the mix for the given conditions. Rigid control of cement content, water-cement ratio and grading of mixed aggregate is assumed.

The notation used herein applies only to the particular subject and does not have the same meaning throughout.

Mixture Equations

Cement Content:

The general equation determining the optimum cement content for any strength is

$$\log C = BK_s + A \tag{1}$$

in which C is the pounds of cement per cubic yard of concrete, K_s is the required compressive strength and B and A are constants for a given slump and maximum size of aggregate.

The absolute volume of cement,

$$C_v = C/\ (\text{Sp. Gr.} \times 62.4) \tag{2}$$

Fineness Modulus of Aggregate:

The general equation determining the optimum fineness modulus of the aggregate is

$$\text{f. m.} = D\ (\log C - E) \tag{3}$$

in which D and E are constants depending upon the quality and maximum size of the aggregate, the uniformity of grading and the shape of particles.

Mixing Water:

The general equation determining the mixing water, for any strength, and required by the particular combination of cement content, fineness of aggregate, and slump of concrete, is

$$W = FC\ (G - \log K_s) \tag{4}$$

in which W is the cubic feet of mixing water per cubic yard of concrete and F and G are constants depending upon the character of cement, aggregates and production control.

The constants A, B, D, E, F and G for average conditions are given in the following tables and equations.

Content of Normal Portland Cement

TABLE 1

Constants for Determining Cement Content for Any Compressive Strength for Given Maximum Size of Aggregate and Slump of Concrete, by Use of the Equation, $\log C = BK_s + A$.

Maximum Size of Aggregate		Slump			
		¾ in.	3½ in.	6½ in.	9 in.
¾ in.	A	2.31389	2.37038	2.41680	2.46889
	B	.0001330	.0001343	.0001496	.0001797
1 in.	A	2.26133	2.31440	2.36829	2.41996
	B	.0001394	.0001416	.0001573	.0001889
1½ in.	A	2.21590	2.27105	2.32726	2.36699
	B	.0001450	.0001472	.0001636	.0001995
2 in.	A	2.16768	2.21592	2.26942	2.32060
	B	.0001508	.0001544	.0001720	.0002085
3 in.	A	2.03119	2.17079	2.21075	2.26132
	B	.0001553	.0001602	.0001809	.0002198

Fineness Modulus of Aggregate

For rounded gravel aggregate, the fineness modulus for any cement content may be determined by the following equations:

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*The words "standard" repeated herein refer to the corresponding A. C. I. standards of 1928.

Max. Size of Aggregate	D	E	
¾ in.	$\text{f. m.} =$	$1.07\,(\log C + 1.88)$	(3a)
1 in.	$=$	$1.07\,(\log C + 2.27)$	(3b)
1½ in.	$=$	$1.07\,(\log C + 2.66)$	(3c)
2 in.	$=$	$1.07\,(\log C + 3.02)$	(3d)
3 in.	$=$	$1.07\,(\log C + 3.43)$	(3e)

Water Content

The equation for mixing water, for any strength and required by the foregoing conditions of cement content, fineness modulus and maximum size of aggregate, the given slump of concrete, and rigid control, is

$$W = 0.0125\,C(4.14613 - \log K_s) \qquad (4a)$$

in which W is the cubic foot of mixing water and C is the pounds of cement per cubic yard of concrete, respectively, and K_s is the required compressive strength in lbs. per sq. in. at 28 days.

Yield of Concrete

The yield of concrete is the ratio of the volume of concrete produced to the sum of the absolute† volumes of cement, aggregate, and mixing water or

$$Ky = \frac{Kv}{Av + Cv + Wv} \qquad (5)$$

$$= 1.00 \pm 0.01 \pm \qquad (5a)$$

Then, practically,

$$Kv = Av + Cv + Wv \qquad (6)$$

in which Ky is the yield of concrete, and Kv, Av, Cv and Wv are the absolute volumes of concrete, aggregate, cement and mixing water, respectively.

Proportioning Two Aggregates

Let

p = the proportion by absolute volume of fine aggregate in the mix.

Then

$l\text{-}p$ = the proportion of coarse aggregate.

Also, let

S = the fineness modulus of the fine,

R = the fineness modulus of the coarse, and

M = the fineness modulus of the mix.

Then

$$M = pS + (1 - p)R \qquad (7)$$

and

$$p = (R - M)/(R - S) \qquad (8)$$

Proportioning Three or More Aggregates

An infinite number of combinations of three or more sizes of aggregates may be made for a given fineness modulus of mix. However, a uniform grading of three or more aggregates for a particular fineness modulus of the mixed aggregate may be obtained by employing the fineness modulus principle in connection with the Talbot-Richart grading equation

$$r = 1 - (d/D)^n \qquad (9)$$

or the Kitts-Pugh equation

$$r = \frac{1 - (d/D)^m}{1 - (A/D)^m} \qquad (10)$$

in which r is the proportion by absolute volume retained on sieve opening of d inches, m and n are exponents, and D and A are the maximum and minimum sizes, respectively, of the aggregate particles.

Tests for Aggregate Characteristics

Tests of the physical characteristics of the job aggregates are essential in order to weigh out or bulk-measure the required absolute volumes, compensate for the moisture content and absorption, and maintain a uniform gradation of sizes of particles. A co-ordinated test procedure is as follows:

Aggregate Tests:

Test A—Weigh water exactly filling standard container.
Test B—Weigh loose-moist aggregate filling container.
Test C—Surface dry B and weigh.
Test D—Dry C at 212° F. and weigh.
Test E—Weigh D inundated, exactly filling container with water.
Test R—Make standard sieve analysis, finding proportions by absolute volume (or by weight) retained on sieves Nos. 100, 50, 30, 16, 8, 4, ⅜ in., ¾ in., 1½ in., 3 in., etc.

Calculations:

d = loose-moist density $= (A - E + D)/A$ (11)
g = apparent specific gravity $= D/Ad$ (12)
a = absorption by absolute vol. $= (C - D)/Ad$ (13)
m = moisture by absolute vol. $= (B - D)/Ad$ (14)
w = weight of moist aggregate in lb. per cu. ft. by absolute vol. $= 62.4\,(g + m)$ (15)
b = bulking of absolute volume by loose measure, moisture and voids $= 1/d$ (16)
$f.\,m. = R_{100} + R_{50} + R_{30} + R_{16} + R_8 + R_4$, etc. (17)

Example of Mix

Assume that we have on the job two sands and two gravels whose physical characteristics at a particular time are as given in Table 2.

TABLE 2

Characteristics of Job Aggregates

Physical Measurements		fm	d	g	m	a
Agg. No.	Practical Screen Size Limits	Fineness Modulus	Loose-Moist Density	Apparent Specific Gravity	Moisture by Abs. Vol.	Absorption by Abs. Vol.
I	0-16	1.84	0.511	2.57	0.174	0.040
II	100-4	3.35	0.585	2.62	0.182	0.026
III	4-¾″	6.55	0.583	2.66	0.113	0.023
IV	¾″-1½″	7.83	0.581	2.67	0.061	0.020

Let it be assumed, further, that we require a concrete of the following specifications:

Maximum size of aggregate, 1½ in.
Slump of concrete, 6½ in.
Strength of concrete at 28 days, 3,000 lb./sq. in.

The cement content per cubic yard of concrete, as indicated for 6½ in. slump and 1½ in. aggregate, is found in Table 1 to be

$$\log C = (.0001636 \times 3000) + 2.32726 \qquad \text{By (1)}$$
$$= 2.81806$$
$$C = 658 \text{ lbs.} = 1.75 \text{ bbl.} = 7 \text{ sacks.}$$

Assuming that the cement has an apparent specific gravity of 3.11, the absolute volume of cement is then

$$658/(3.11 \times 62.4) = 3.395 \text{ cu. ft.} \qquad \text{By (2)}$$

The absolute volume of mixing water per cubic yard of concrete is

$$W = (.0125 \times 658)\ (4.14613 - \log 3000) \qquad \text{By (4)}$$
$$= 5.5 \text{ cu. ft.}$$

The absolute volume of mixed aggregate per cubic yard of concrete is

$$Av = Kv - Cv - Wv \qquad \text{By (6)}$$
$$= 27 - 3.395 - 5.5$$
$$= 18.105 \text{ cu. ft.}$$

The fineness modulus of the mixed aggregate is

$$f.\,m. = 1.07\ (\log 658 + 2.66) \qquad \text{By (3c)}$$
$$= 5.86$$

---

†"Absolute volume," as used herein, is generally termed "apparent volume" by concrete physicists. It is the volume within the surfaces of the particles in the cases of cement and aggregate.

By trial, employing equation (9), it is found that the grading equation for a fineness modulus of 5.86 with 1½ in. maximum size of aggregate, is

$$r = 1 - (d/1.5)^{.53} \qquad (9a)$$

and the proportions retained on each of the standard sieves is as given in Table 3.

TABLE 3

Theoretical Gradings of Aggregates for $D = 1.5$ in. and $n = .53$

		Proportions Retained		
			No. 4-1½″	0-No. 4
Sieve No.	(d) Inches	Mixed Aggregate r	$\frac{r}{r'} \ngtr 1$	$\frac{r-r'}{1-r'}$
100	.0059	.95	1.00	.85
50	.0117	.92	1.00	.76
30	.0234	.88	1.00	.64
16	.0469	.84	1.00	.51
8	.0937	.77	1.00	.30
4	.187	$r' = .67$	1.00	.00
⅜ in.	.375	.52	.78	—
¾ in.	.75	.31	.46	—
1½ in.	1.5	.00	.00	—
Fineness Modulus		5.86	7.24	3.06
Job Aggregates		I, II, III, IV	III & IV	I & II

Table 3 shows that job aggregates I & II should be combined for a fineness modulus of 3.06 and III and IV for a fineness of 7.24 and that there is 67 per cent of the coarse combination with 33 per cent of the fine. Applying equation (8), we find the proportions of the job aggregates as follows:

$$.33\,\frac{(3.35 - 3.06)}{(3.35 - 1.84)} = .06 \text{ of I}$$

$$.33 - .06 = .27 \text{ of II}$$

$$.67\,\frac{(7.83 - 7.24)}{(7.83 - 6.55)} = .31 \text{ of III}$$

$$.67 - .31 = .36 \text{ of IV}$$

Total 1.00

The proportions by absolute volume for one cubic yard of concrete are then

			Absolute Volume, cu. ft.	
	Cement		= 3.395	By equations (1) and (2)
	Mixing water		= 5.500	By equation (4)
I	Fine sand	.06 × 18.105	= 1.086	Proportion × abs. vol. of aggregate.
II	Coarse sand	.27 × 18.105	= 4.888	
III	Fine gravel	.31 × 18.105	= 5.613	
IV	Coarse gravel	.36 × 18.105	= 6.518	
		Total	27.000	

The mixing water plus the absorption of the aggregate less the moisture content of the aggregates determines the water to be added. The correction is made as follows:

$$5.5 - 1.086\,(0.174 - 0.040) - 4.888\,(0.182 - 0.026) - 5.613\,(0.113 - 0.023) - 6.518\,(0.061 - 0.020) = 5.5 - 1.572 = 3.928 \text{ cu. ft. of water to be added.}$$

The job proportions, measuring aggregates by loose-moist volume, are then:

			Loose-Moist Volume	
	Cement	658/94	= 7 sacks	= 94 lb. per sk.
	Added water	3.928 × 7.5	= 29.5 gals.	= 7.5 gal./c.f.
I	Fine sand	1.086/0.511	= 2.1 cu. ft.	$= \frac{\text{abs. vol.}}{d}$
II	Coarse sand	4.888/0.585	= 8.3 cu. ft.	
III	Fine gravel	5.613/0.583	= 9.6 cu. ft.	
IV	Coarse gravel	6.518/0.581	= 11.2 cu. ft.	

The job proportions by moist weight are:

			Moist Weight, lbs.	
	Cement		= 658	
	Added water	3.928 × 62.4	= 245	= 62.4 bbl./c.f.
I	Fine sand	1.086 (2.57 + .174) 62.4	= 186	= abs. vol. × (g + m) × 62.4
II	Coarse sand	4.888 (2.62 + .182) 62.4	= 855	
III	Fine gravel	5.613 (2.66 + .113) 62.4	= 972	
IV	Coarse gravel	6.519 (2.67 + .061) 62.4	= 1,110	
		Total	4,026	

This presents the "absolute basis of proportioning" developed and used by the author since 1924. It covers the complete scientific and practical operations in the proportioning and measurement of basic concrete mixtures.

Oil-Mixed Concrete

By H. L. KAUFFMAN

In making oil-mixed concrete, the amount of oil used in no case should exceed 10 per cent of the weight of the cement, and for the most part 5 per cent is all that is necessary. Since a bag of cement weighs 94 lbs., 4.7 lbs. of oil—or about 2½ quarts—should be added for each bag of cement used in the mixture. The sand and cement should be first mixed with the proper amount of water into a stiff mortar, to which is added the correct amount of oil, and the whole mass again thoroughly mixed until all traces of oil have completely disappeared. Particular care should be taken to see that the oil is thoroughly incorporated in the mixture. Therefore, the time of mixing should be almost double that employed when no oil is used. Consequently, a continuous mixer should not be utilized in oil-cement-concrete work, as it is difficult with this type of machine to increase the time of mixing sufficiently. For making oil-mixed mortar, use 1 part of cement and 2 parts of sand—adding to the whole 5 per cent of oil. The resultant mixture will be sufficiently non-absorbent for all practical purposes.

If the right kind of oil is properly mixed with concrete or mortar, the tensile strength of the mortar or of the concrete will not be impaired. In Department of Agriculture Bulletin No. 230 titled "Oil-Mixed Portland Cement Concrete" are given the following specifications for the kind of oil which may be mixed with mortar or concrete to insure damp-proof construction:

1. The oil shall be a fluid petroleum product and shall contain no admixture of fatty or vegetable oils.
2. It shall have a specific gravity not greater than 0.945 at a temperature of 25 deg.
3. It shall show a flash point of not less than 150 deg. C. by the closed-cup method.
4. When 240 c. c. of the oil is heated in an Engler viscosimeter to 50 deg. C., and maintained at that temperature for at least three minutes, the first 100 c. c. which flows out shall show a specific viscosity of not less than 15 nor more than 30.
5. When 1 part of the oil is shaken up with 2 parts of hundredth normal caustic soda there shall be no emulsification, and upon allowing the mixture to remain quiet the two components shall rapidly separate in distinct layers.

However, as previously mentioned, the amount of oil used must not exceed 10 per cent of the weight of the cement.

Concrete mixed with oil takes much longer to set hard, perhaps twice as long, but the increase in strength is nearly as rapid in the oil-mixed material as in the plain concrete. The use of oil does not make the concrete impervious to heavy water pressure, but it does make it practically non-absorbent under low heads. Use of oil decreases somewhat the compressive strength of mortar and concrete, but not seriously.

From the Products Associations' Bulletins

Iowa Concrete Products Association

R. L. GAVIN, Secretary-Treasurer

"PROSPECTIVE builders when interviewed about the type of material contemplated for their structures often remark that no one around their town is making concrete building units or the manufacturer that is there is not reputable, makes an inferior product, couldn't supply the job if concrete units were used: all of which is a direct reflection on the business ability of the manufacturers of concrete products," according to the Iowa Association "Concrete Products News."

"Then there's the attitude of the local banker whose money is loaned to finance the buildings. In most cases he knows nothing about the relative merits of building materials, has never been in a concrete products plant, has never seen a concrete building unit made, has never had a call from a products manufacturer and is 'thumbs down' when his opinion on building material is sought. He shakes his head sadly, turns a cold clammy eye on the interviewer and remarks, 'Concrete is no good because it leaks.' And that goes for every concrete unit made in North America. They are all placed under the same general classification, 'no good,' the "News" continues.

"Concrete products can be sold in far larger numbers than at present in the Iowa building market, but not until the 'Rip Van Winkles' in the industry awake to the possibilities," it adds.

The Ohio Concrete Burial Vault Manufacturers' Association is thriving, it is reported, showing evidences of becoming a strong national organization by the opening of its membership to all United States concrete vault manufacturers. The Ohio Association is thus far the only group of its kind and to date manufacturers from New York, New Jersey, West Virginia, Pennsylvania, Indiana and Michigan are reported to have joined the Ohio Association.

Block manufacturers are advised to participate in the airport activity getting under way both locally and nationally. The "News" reports one airport company to be planning a very extensive building program covering the entire country and if products men are alert to their opportunities, much of their material can be sold in these structures. "The architects for the organization will permit alternate bids on concrete masonry, but the products manufacturer must be prepared to furnish the data showing the ability of his product to meet A. C. I. specifications, as well as cost data compared to competitive load bearing materials and names of architects who have used concrete masonry in the locality," it concludes.

Wisconsin Concrete Products Association

JACK FRANKLIN, Secretary

"MORE About Fire Resistance" is given in an October Wisconsin Association news letter.

It says in part, "Most concrete products manufacturers know that concrete masonry is the only hollow masonry that has received official rating as a standard fire retardant material, but here is a little further information along the same line. An extract from the Underwriters' Laboratories Retardant Report No. 1555, giving the results of fire exposure tests upon hollow concrete masonry units:

" 'Walls composed of these units do not add fuel to fire. From the fire protection point of view their use is to be preferred over walls of combustible material or of non-combustible material the strength of which is seriously affected by fire temperatures.' "

An extract from the association's "Digest," published monthly, says, "Order No. 5332 of the state building code, under sub-title 'Tests' reads: 'Typical specimens of all sizes and designs of concrete block used in exterior or bearing walls shall be tested in an approved manner, originally to prove compliance with the requirements of this code, and therefore at intervals of not more than one year.' "

"Most plants make a large number of different sized units and the testing of these blocks is quite an item of expense, but how many plants get any return on this investment? How many plants tell the public, through some sort of advertising, that their products pass the state code requirements and that from all practical standpoints their product is the best building unit on the market? If you believe in your product, you should convince the public that your product is THE product and if you do not believe in your product you better start looking for something else to do. This products business is coming to the point of the survival of the fittest and the fellow who does not have the interest of his plant at heart is going to lose out."

"Are You Going After Volume or Profits?" the Digest asks, and continues:

"It's getting to be a rather old story in the concrete products business, this question of selling for profit or for volume. Many products manufacturers who were bitten by the 'volumitis' bug several years ago are now regretting their exposure to this malady.

"True, these men have built up a tremendous volume of business, but in so doing they have overlooked many items that should have made them profits. If increased volume does not mean increased profit, it is a liability. Some form of extra compensation for the production of profits and less emphasis on the new account seems a logical suggestion to the concrete products salesman."

The dangers of a figurative Chinese wall around a successful concrete products business are pointed out. It is advocated that as soon as a company begins to be successful and it has been demonstrated that it is making a good product, the next thing for the company to do—if it wants to keep on growing—is to tell more people about that product and make them want it.

"Building a Chinese wall of silence around a business is a dangerous and expensive proposition. If you are successful, let people know about it. They will talk about your success and your product and excite more curiosity about it.

"The unadvertised business of today is an object of wonder and is progressing only under the most adverse circumstances."

Reinforced Concrete Design Simplified

Chart B_1—Bending Moments

By JAMES R. GRIFFITH
Professor of Structural Engineering, Oregon State Agricultural College

American Concrete Institute Building Code

$$M = \frac{w\,l^2}{8} \qquad M = \frac{w\,l^2}{16}$$

$$M = \frac{w\,l^2}{10} \qquad M = \frac{w\,l^2}{24}$$

$$M = \frac{w\,l^2}{12}$$

NUMEROUS requests have been made for a chart to solve the various equations for bending moments due to uniform loads. Chart B_1 is presented to meet that demand. It is not confined to any specific code, for the formulas are to be found in many specifications. Neither is the use of this chart confined to concrete design, being applicable to any type of construction when the identical formulas are specified.

That portion of the American Concrete Institute Building Code specifying the various moment coefficients will be quoted for the convenience of the reader:

"Sec. 708: Moment Coefficients for Freely Supported or Slightly Restrained Continuous Beams or Slabs of Approximately Equal Span; Uniform Load:

"(a) Beams and slabs of approximately equal spans freely supported or built to act integrally with beams, girders, or other slightly restraining support, or beams and slabs built into brick or masonry walls in a manner which develops only partial end restraint, and carrying uniformly distributed loads shall be designed for the following moments at critical sections:

"(1) Beams and slabs of one span,

Positive moment near center,

$$M = \frac{w\,l^2}{8}$$

"(2) Beams and slabs continuous for two spans only,

Positive moment near center,

$$M = \frac{w\,l^2}{10}$$

Negative moment over interior support,

$$M = \frac{w\,l^2}{8}$$

"(3) Beams and slabs continuous for more than two spans,

Positive moment near center and negative moment at support of interior spans,

$$M = \frac{w\,l^2}{12}$$

Positive moment near centers of end spans and negative moment at first interior support,

$$M = \frac{w\,l^2}{10}$$

"(4) Negative moment at end supports for cases (1), (2), and (3) of this section,

$$M = \text{not less than } \frac{w\,l^2}{24}$$

"Sec. 709: Moment Coefficients for Fully Restrained Continuous Beams or Slabs of Approximately Equal Span: Uniform Load:

"(a) Beams and slabs of approximately equal spans built to act integrally with columns, walls, or other restraining supports and assumed to carry uniformly distributed loads, shall (except as provided in Sec. 708) be designed for the following critical sections:

"(1) Interior spans;

Negative moment at interior supports except the first,

$$M = \frac{w\,l^2}{12}$$

Positive moment near centers of interior spans,

$$M = \frac{w\,l^2}{16}$$

"(2) End spans of continuous beams or slabs, and beams or slabs of one span;

Where I/l is less than twice the sum of the values of I/h for the interior columns above and below which are built into the beams:

Positive moment near center of span and negative moment at first interior supports,

$$M = \frac{w\,l^2}{12}$$

Negative moment at exterior supports,

$$M = \frac{w\,l^2}{12}$$

Where I/l is equal to or greater than twice the sum of the values of I/h for the exterior column above and below which are built into the beams:

Positive moment near center of span and negative moment at first interior support,

$$M = \frac{w\,l^2}{10}$$

Negative moment at exterior support,

$$M = \frac{w\,l^2}{16}$$

"(b) In this section, I represents the moment of inertia which, for those calculations, shall be computed on the assumption that the member is homogeneous, neglecting the reinforcement, but including that portion of the concrete section outside the reinforcement which is ordinarily considered as fireproofing. l and h are the span length and column height, respectively, as defined in Secs. 702 and 1102."

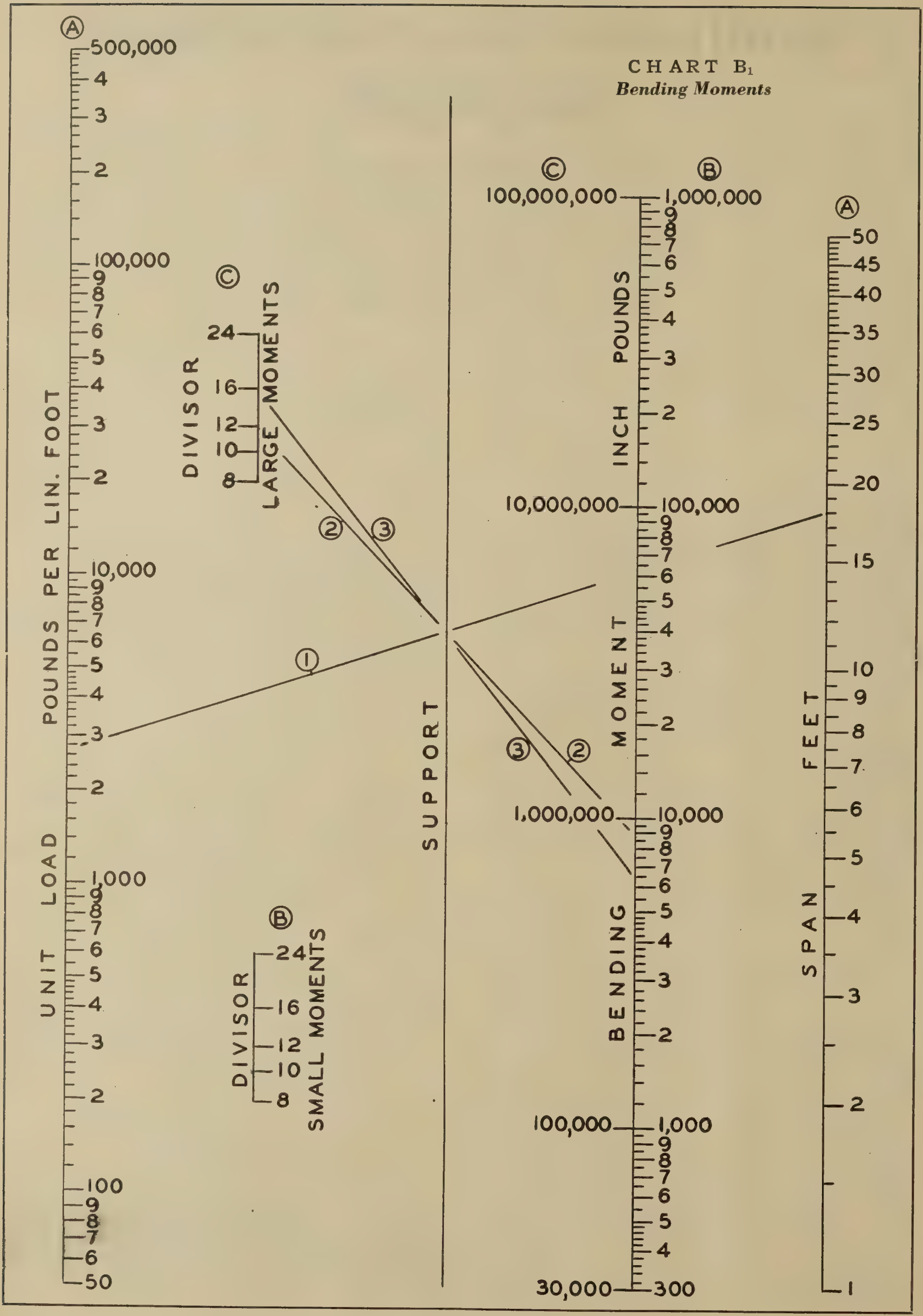

CHART B_1
Bending Moments

Construction of Chart B_1

The general equation for bending moments due to uniform loads might be written

$$M = \frac{w\,l^2}{C}$$

M = bending moment, inch pounds,
w = uniform loads, pounds per lin. foot,
l = span, feet,
C = coefficient, 8, 10, 12, 16, 24

Transforming this general moment equation to the form

$$M\,C = 12\,w\,l^2$$

and equating each side to a common function (f), I have

$$f = 12\,w\,l^2$$
$$f = M\,C$$

two equations of three variables each, one variable being common to each equation. Both equations resemble the general equation

$$C = L^{mn/r} \cdot R^{m(1-n)} \qquad \text{Eq. 7}$$

requiring logarithmic co-ordinates for nomographic construction.

Taking the first expression

$$f = 12\,w\,l^2$$

and assuming the A-5 scale for the left (L) scale for values of (w), and the A-10 scale for the right (R) scale for values of (l), I will then have the ratio

$$r = 2$$

Equating the general exponents of Eq. 7 to the actual exponents of the equation to be plotted and substituting this value of ($r = 2$), I have

$$\begin{cases} mn/r = mn/2 = l \\ m(l\text{-}n) = 2 \end{cases}$$

Solving these two equations simultaneously for values of (n) and (m), I get

$$n = \tfrac{1}{2}$$
$$m = 4$$

Thus the central scale must be half way between the two outside scales and be calibrated with a scale one-fourth the size of the (A-10) scale. A construction isopleth through the values ($w = 50$) and (span = 1) would give a value at the construction isopleth of

$$f = 12\,w\,l^2 = 12 \times 50 \times 1 = 600$$

In order to use this same (f) scale as a support without co-ordinates for the second expression

$$f = M\,C$$

I must assume the same co-ordinates as found for the first expression or one-fourth the size of the (A-10) scale. Assuming the (A-5) scale for values of (M) appearing on the right (R) scale, I will have a value of

$$m = 2$$

Now equating the general nomographic exponents of Eq. 7 to the actual exponents of the expression to be plotted, I have

$$\begin{cases} mn/r = 1 \\ m(l\text{-}n) = 1 \end{cases}$$

I will then obtain values of

$$n = \tfrac{1}{2}$$
$$r = 1$$

These values will indicate that the central scale must be located half way between the two outside scales, and the A-5 scale will be used for the left (L) scale for values of (C). Taking the same value at the construction isopleth ($f = 600$) obtained for the first expression, and a value of ($M = 300$), I will have a value of

$$C = \frac{f}{M} = \frac{600}{300} = 2.0$$

at the construction isopleth. There are only five values of (C) of interest, so I have shown but those values on the (C) or Divisor scale.

The assumed co-ordinates for values of (M) gave a satisfactory scale spacing but did not give the desired range of values. So I took a value at the construction isopleth of $M = 30{,}000$ and obtained a value of

$$C = \frac{f}{M} = \frac{600}{30{,}000} = 0.02$$

at the construction isopleth for a new (C) scale. Again locating the five desired values of (C), I have two sets of (C) values, one to be used with the small moments, the other to be used with the large moments.

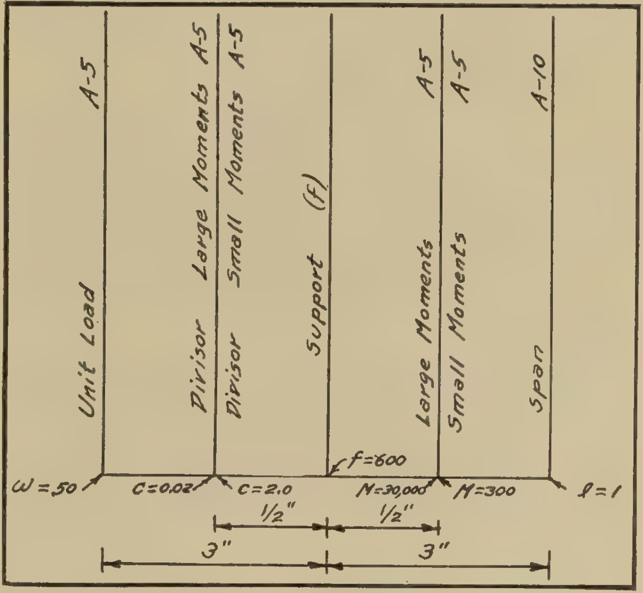

Figure 1-B_1

Fig. 1-B_1 shows the complete information by which the original Chart B_1 was constructed.

Use of Chart B_1

In solution the unit load and the span usually remain fixed. So a solution isopleth (1) has been drawn between values of ($w = 2{,}630$ lbs. per ft.) and a span of ($l = 18$ ft.). The intersection of isopleth (1) and the support is taken as a point of rotation. Isopleth (2) gives, for a coefficient of (12), a moment of ($M = 860{,}000$ in. lbs.). Isopleth (3) gives, for a coefficient of (16), a value of ($M = 640{,}000$ in. lbs.). These solution isopleths have been used to solve the bending moments of Mr. Lord's problem (1)* wherein he obtains

Total uniform load = 2,630 lbs. per ft.

$$\frac{w\,l^2}{12} = 852{,}000 \text{ in. lbs.}$$

$$\frac{w\,l^2}{16} = 639{,}000 \text{ in. lbs.}$$

The other set of coefficients, or divisors, could just as well be used providing the corresponding moment scale is used. Use the scales giving the best intersection.

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*Design Data for A. C. I. Building Code.

Buried Reservoir Design

The second installment of David R. Landau's article on the design of concrete reservoirs will appear in an early issue.

The first part of the article appeared in the October issue.

Wisconsin Concrete Products Association Announces Plans for 1930 Convention

During the past month plans have been completed for the 1930 convention of the Wisconsin Concrete Products Association. This meeting, which will be the eighth that the Wisconsin group has held since its formation in 1922, promises to outshine any previous convention held by this aggressive group of concrete products manufacturers. The exact dates of the meeting are Wednesday and Thursday January 29th and 30th, and the place the Hotel Plankinton, Milwaukee.

Work Begun On Program

A committee headed by Harry Shields of the Julius Sorenson & Sons Company of Racine has been at work on the convention program and arrangements since early in August. Preliminary announcements show that this committee has put hard and conscientious thought on the problems confronting the concrete products manufacturer in this era of swiftly changing business conditions, and will furnish a program that provides for the situation as it exists today.

Following a short address by the president, the morning of the first day will be occupied by reports of district representatives of the Association. Instead of employing the usual hackneyed report of business conditions in his territory each representative will present a five minute paper on "My Outstanding Job This Year and How I Landed It."

Products Bureau Session

These reports dovetail into the afternoon session of the first day, which will be conducted by representatives of the Cement Products Bureau of the Portland Cement Association, with Big Bill Allan acting as master of ceremonies. Following this presentation, ample time has been allowed for round table discussion of any points that may have arisen during either the morning papers or the presentation of those during the afternoon. Last year a similar discussion held the crowd well past the appointed dinner hour. With the features planned for this year, it is expected that the program will carry over equally as well.

The program this first day will be concluded with a surprise number. Just what this will be is as yet a secret, but needless to say it will furnish plenty of amusement and at the same time drive home a lesson much needed by products manufacturers.

The evening of the first day had been left open as a "do as you please" session. Committee meetings will be held and visitors to Milwaukee will be given an opportunity to visit friends or amuse themselves as they see fit.

Ten-Minute Papers

Practically all of the second day will be devoted to prepared 10 minute papers. The subjects for these papers have all been assigned and in some cases the papers have already been prepared. No announcement of subjects will be made at this time, but it can be stated that they cover thoroughly the entire field of manufacturing and selling.

Another surprise has been reserved for the concluding number of the second day's program. The committee feels that they have been especially fortunate in securing this speaker—a man known throughout the nation for the work he has done in his particular field.

Traditional Banquet

Then comes the concluding item on the program—the banquet. Little need be said about that to anyone who has ever attended a Wisconsin Concrete Products Association banquet, and most people who haven't attended have heard about them.

Last year concrete products manufacturers from seven states attended the Wisconsin convention, which had an attendance of over 275. The committee hopes that the attendance will be larger this year, and invites concrete products manufacturers all over the United States to make plans to attend.

A Job Made Sieving Machine

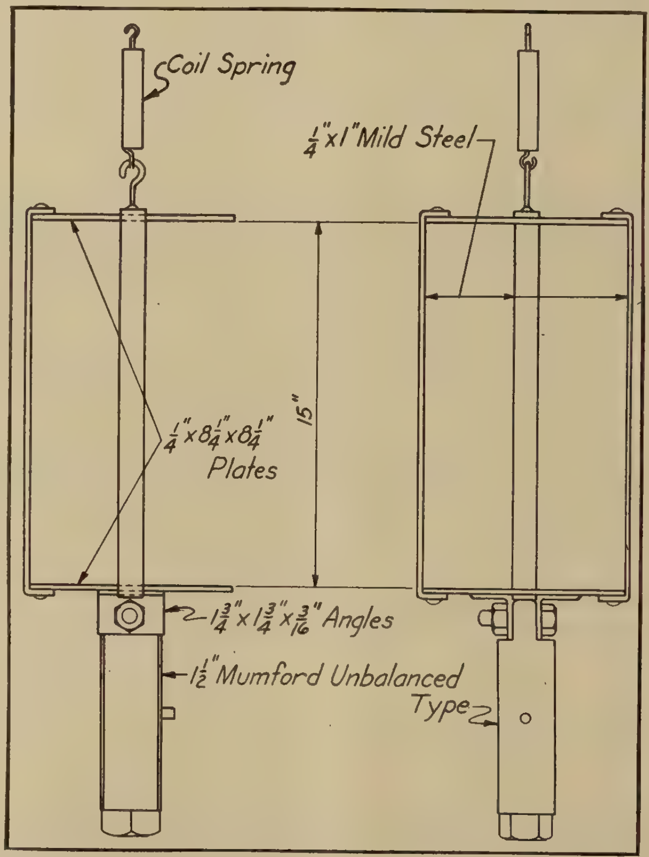
By **MILES N. CLAIR**

Vice-President, The Thompson & Lichtner Co., Inc.

Control of concrete quality in the field as well as in concrete products plants always includes the making of a sieve analysis of the aggregates at regular intervals. This is a rather long and tedious job when done by hand and is therefore usually slighted. Uniformity of procedure requires a mechanical sieving machine. The cost of the usual sieving machine, however, is too great for many temporary field laboratory installations and small concrete products plants.

Details of Sieving Device

The illustration below gives the details of a simple mechanical sieving device used on work under the writer's supervision. The device makes the complete standard sieve separation of a sample of sand in about three minutes. The arrangement as given uses a fixed frame to take the standard series of sand sieves and uses a pneumatic vibrator. The apparatus can be made up on any job or in any plant shop and the design can easily be changed to be adjustable to any number of sieves. An electric vibrator instead of air can also be used.


Coil Spring
$\frac{1}{4}$"x1" Mild Steel
15"
$\frac{1}{4}$"x$8\frac{1}{4}$"x$8\frac{1}{4}$" Plates
2-$1\frac{3}{4}$"x$1\frac{3}{4}$"x$\frac{3}{16}$" Angles
$1\frac{1}{2}$" Mumford Unbalanced Type

A. B. Shenk of the Federal Cement Tile Company is responsible for the design as shown.

Concrete for the Builder

WHEN this department was started a number of months ago, we began looking for actual instances of where contractors had built up profitable businesses through advertising followed by personal selling.

In every other line of business advertising and personal selling had brought results. Why not in the concrete contracting industry? It was not surprising that many instances were found where contractors had already proved the business building value of personal salesmanship and of intelligent advertising.

Some of these instances have been reported in the pages of this section. They have shown without the shadow of a doubt that selling pays in the contracting field. Still other examples are in our files waiting for the space to publish them.

One of the principal functions of this section is to point out the value of this type of activity to contractors and to urge them to do likewise. Now, when the winter season sets in, is a good time to start. (Incidentally, be sure to read this month's article on "Winter Selling of Spring Business.")

As the actual field work slacks off this winter, make a start at this selling effort. You don't have to hire a man for that purpose to start. Go out yourself and prove to your own satisfaction that personal selling pays. Once you try it, you will wonder why in the world you never did it before.

—‡—

WE hear a lot about the fellow who steps in and takes the job away by cutting his price and then making it up by skimping on his materials or on his workmanship.

Much of this could be done away with if the man for whom the work was being done was properly sold on getting a first class job. But usually he knows little or nothing about construction and, as a result, he listens to the contractor who talks lower prices.

If the buyer of the contractor's service is sold on quality work and on your ability to give him a quality job, the price-cutter has a hard time. But in order to gain the prospect's confidence, you've got to ***sell*** him.

—‡—

NEXT month's issue will cover the subject of basement and foundation construction in addition to the experience stories that describe methods by means of which the jobs were landed.

The use of concrete for basement foundations offers a fertile field for the builder in both new and old residences. These days there is much activity in making basements more livable. A concrete job can turn a basement from more or less of a waste space into a livable unit. An attractive, dry basement adds another floor to the house at small cost.

—‡—

IN the January issue we are going to bear heavily on the subject of driveways and related structures. A paved street is little good unless it is continued from the street to the point where the load is delivered. Ten feet of mud can mire a truck as effectively as ten miles.

There are so many instances where driveways are needed that they furnish a market for the concrete contractor in practically every locality.

—‡—

THE Portland Cement Association is planning to hold a large number of special meetings for the concrete builder this winter. A great many cities have been selected for these meetings so that every builder can attend.

Details of the time and place of these meetings are not yet announced but as soon as they are we will tell you about them. They will be of dollars and cents value to you and you can't afford to miss them.

Concrete for Permanence

Methods of Placing

The Five Requirements for Durable Concrete. (Summarized from Installment No. 1 in the June issue):

1. Durable, impervious aggregates.
2. A watertight binding medium—the hardened cement-water paste.
3. A mixture that permits complete incorporation of the aggregates in the paste.
4. Methods of mixing and placing to secure a uniform homogeneous mass.
5. Adequate protection and curing.

(Installment 6)

By F. R. McMILLAN

IN the earlier installments of this series we have seen that durable concrete depends upon durable aggregates thoroughly incorporated in a watertight binding medium. The selection of aggregates has not been covered in detail. It must not be inferred that this is unimportant. Durable minerals, however, are so widely distributed that the selection of proper aggregates usually need offer no difficulties.

The watertightness of the binding medium has been shown to depend on the proportion of water and cement and the extent to which the chemical reactions have been completed, that is, upon the water-cement ratio and the degree of curing. Recommendations have been given for a minimum curing period and water-cement ratios to meet various conditions of exposure. It has also been shown that through the use of proper proportions of fine and coarse aggregate and plastic consistency, the amount of paste can be made sufficient to thoroughly incorporate the aggregates and seal the mass against penetration of water.

With these requirements fulfilled, it requires only thorough mixing, careful handling and placing, and adequate protection and curing to produce a mass that will be resistant to the penetration of water and destructive effects of weathering. Too much emphasis cannot be placed upon the need for care in respect to the operations of transporting and placing. By careless manipulation the greater part of the benefits of good materials, suitable mixtures, and proper water ratios may be lost. Of all the defects encountered in structures in service, those resulting from improper manipulation far outnumber those from all other causes combined. The principal difficulties are the segregation of materials in handling and placing and the failure to thoroughly bond successive layers. Segregation causes honeycombing, accumulation of water, and laitance which form ready points of attack for percolating water and destructive weathering agencies. Improper bond between successive layers provides channels through which water can percolate, slowly dissolving out essential ingredients and providing further opportunity for frost action.

Whatever the method of transporting and placing, operations should be so conducted that the concrete when finally in place will be uniform throughout the entire section. For plastic concrete, the batches should be placed as nearly as possible in their final location; allowing the material to flow to distant points is objectionable. Over-manipulation should also be avoided; and in deep lifts the tendency to gain water in the upper layers should be compensated.

Adequate bonding depends on proper surface texture of the completed layer, and ample mortar content in the fresh concrete at the place of contact. Wetting the cleaned surface well in advance will usually provide a moderate degree of suction which is to be preferred to either an extremely dry or thoroughly saturated surface. A layer of mortar, or an excess of mortar in the first batches of the newly placed concrete will aid greatly in making a watertight bond, as it permits the complete incorporation of the coarse aggregate at the surface of contact and prevents the honeycomb which often occurs at this point if special care is not taken.

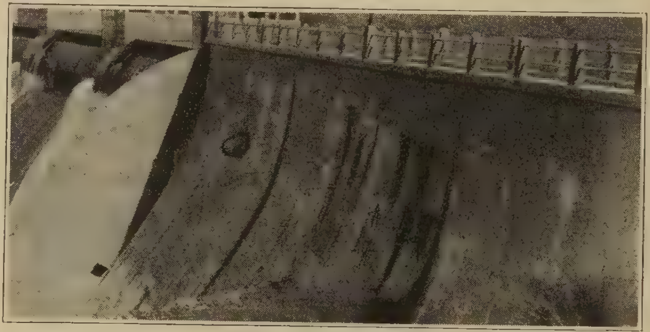


Fig. 7. Portion of a dam built in 1923. Note evidence of leakage at horizontal joints and irregular fill planes

The picture of Fig. 7 shows some of the results of improper manipulation. That the materials themselves are suitable is shown by the fact that most of the exposed area is unaffected even though subjected to the same exposure.

Note: The October installment of this series, telling of the complete incorporation of aggregate in the paste, was also written by F. R. McMillan.

Credit was inadvertently omitted.

Winter Selling of Spring Business

The Off Season Can Be Made Profitable When It Is Used to Develop Next Year's Business

PROGRESSIVE concrete builders usually are busy during the spring, summer and fall out on the job. What do these progressive builders do during the winter in the so-called "off season" of the year?

Become a Salesman During Winter

There is but one answer to this question and the work they get during the spring, summer and fall is excellent evidence of that. These progressive builders become salesmen; they get out among the prospects who can use the services of a concrete contractor in the spring and obtain contracts for work of all kinds.

There are also some concrete builders who fail to realize that winter selling of spring business is good business practice. Instead of promoting concrete and arranging for work to be done in the approaching spring, they sometimes go in the trucking business during the winter and use their trucks for hauling coal. Others join the "hot stove league" and replay the last world's series until it has been won again and again by the baseball team that did not win it even in the first place. Meanwhile, they are hoping for a "good break" in the spring. They hope that people will walk in and ask them to do concrete work and that, all in all, the coming spring will bring profitable jobs.

The contractor that gets a "good break" in the spring is the one who does winter selling of spring business. He paves the way for this "break" by contacting the various people in his market who will have need for the services of a concrete contractor in the spring and ensuing months.

Contacting the Large Builders

One of the first contacts the progressive concrete contractor makes when he is paving the way for spring business is with the large builders, those who sub-let their concrete work. Just one call on each of these large builders is not sufficient; several probably are necessary to accomplish what the concrete contractor has in mind. He is attempting to get a contract to handle all of the concrete work of the large builder exclusive, of course, of that part of the work involving engineering design. He can show the large builder that his equipment allows him to handle such concrete work as floors, foundations, footings, curbs, gutters, walks, drives, paved yards and so forth. Likewise, he can prove that, as a concrete contractor, he has an excellent reputation for high quality work and good service by giving former satisfied customers as references. Through aggressive salesmanship and making the right contacts the progressive concrete builder lands contracts for enough work to keep one or two crews busy during the forthcoming spring and well into the summer and fall.

Working with Real Estate Builders

Likewise, the progressive builder interviews and keeps in touch with realtors and real estate builders. During the winter many real estate firms and others make plans for extensive housing developments on which work will start in the spring. Thus, it is worth considerable effort on the concrete contractor's part to attempt getting in on this business. Such projects involve construction of sidewalks, driveways, curbs, gutters, foundations and they can be made to include concrete floors.

ADDED SERVICE

During the winter months we can devote more time to your building problems. At this season we can help you plan a better building.

Clark & Smith, Inc.

GENERAL CONTRACTORS

13 Temple Street. Granite 3632. QUINCY

This concrete builder's newspaper advertisement was published once in December and three times in January as part of a winter selling program

In going after this business the progressive builder shows the real estate builder or whoever is planning the housing project that reinforced concrete floors for residences have many advantages over other types. He explains that most plaster cracks develop in dwellings because ordinary floors sag or shrink. He also points out that floors which shrink are responsible for doors being out of plumb or for cracks developing between the floor and the baseboard. In fact, it is an important sales aid to be able to show that a concrete first floor not only eliminates plaster cracks and other possible defects in house construction, but that it will greatly reduce interior and exterior maintenance.

Help!! Help!! Help!!

We can do just this for you with your building project. During January and February we can devote more time to planning and can, thereby, assist you more ably, to acquire the building you want. Hence, you receive

BETTER SERVICE NOW

CLARK & SMITH, *Inc.*

GENERAL CONTRACTORS

13 Temple Street. Granite 3632. QUINCY

Another newspaper ad published in January to help out the winter selling campaign

Another important selling point is that concrete floors are firesafe. A concrete floor will prevent the spread of basement fires which cause about 30 per cent of the

$160,000,000 residence fire loss each year. The builder assures the realtor that he, in turn, can use the concrete floor as a sales aid. The prospective home buyer can be shown that his family and cherished possessions will be adequately safeguarded against the dangers of basement fires when the house has a concrete first floor. Protection against storms is another of the strongest sales points for a reinforced concrete first floor.

Coal and Building Material Dealers

The progressive builder also develops spring business through winter selling by working with coal and building supply dealers; offering to build concrete paved yards, driveways, bins and retaining walls.

In the coal business the slack season usually is in the spring, making this season of the year the ideal time for taking care of needed improvements. Realizing that there is hardly a coal yard that cannot be improved in some way, the progressive concrete contractor visits the coal dealers and talks about concrete improvements. He shows them how such improvements will facilitate handling of coal, reduce waste and help bring increased profits. He also gives reasons why the cost of the improvements will be comparatively low, stressing the fact that coal is rather expensive to use as a paving material. Furthermore, he points out that the operation of the coal yard will not be hampered if the improvements are made in the spring during the slack season of the year.

Builders have found that the winter is the best time to show the coal dealers the disadvantages of unpaved yards. This is especially true during the closing days of winter when the ground begins to thaw out and the yards become almost if not altogether impassable.

Building material dealers need concrete improvements —paved yards, driveways, bins and retaining walls. The live-wire contractor ordinarily has good contact with these dealers through his business relations with them. In the spring, summer and fall he buys their materials; in the winter, he sells them concrete improvements that will help them do a bigger and better business.

Home modernizing work is also sold by many progressive concrete builders during the winter. When a family spends a winter in a house, its shortcomings as a place of residence are more noticeable then than at any other season of the year. The concrete contractor who does winter selling of spring business points out that modernizing work can go hand in hand with spring house cleaning; that the house will present a better appearance during the summer and years to come and that it will have every convenience for the following winter, provided needed improvements are made with concrete.

No matter what the size of the structure to be modernized, the concrete builder is able to show that concrete has a wide range of usefulness for making improvements that enhance the beauty and increase the value and utility of the property. The market for concrete work includes footings, foundations, basement floors, porches, steps, walks, drives, alley pavements, plaster, stucco and countless other uses of concrete. In the group of concrete improvements that add a decorative touch to the home's surroundings are lawn benches, bird baths, sun dials, flagstone walks, lily pools, flower beds, flower boxes, swimming and wading pools, tennis courts, garden walls and other similar uses. These improvements can be sold in the winter and built in the spring.

Contacting Municipal Officials

There are many concrete builders who do promotion work among park and other city, village or town officials during the winter in an effort to produce spring business. There is hardly a community where the market for swimming pools, wading pools and tennis courts is completely untouched. It is this market that the winter workers in the concrete contracting business are trying to sell.

Aggressive personal selling is bringing concrete business for live-wire contractors. Some of them start campaigns for a community swimming pool, soliciting the aid of such clubs as Rotary, Kiwanis, Lions and commercial organizations and sometimes, American Legion posts and newspapers. Others, where it is inadvisable to promote municipal pools, try to interest individuals or groups of local business men to build a pool to operate for profit. When favorably located and wisely operated such pools pay handsome profits.

Selling Concrete Sidewalks

Strange as it may seem, during the winter when the sidewalks are covered with the snow, is a good time to sell concrete sidewalks. This is especially true in residential communities where the man of the house takes pride in keeping the walks clean. If the sidewalk is in need of repair, it is hard to clean. A survey of the residential section is often made by builders to determine the location of defective walks. When these are found a prospect list is prepared and the property owners are contacted on the sidewalk proposition. Although practically every one is sold on concrete as a sidewalk material, the contractors are realizing that they must develop sidewalk business instead of waiting for it to come to them.

When contacting property owners and municipal officials, many builders stress the fact that unless repaired, broken or uneven slabs rapidly become worse and present an unsightly appearance. Broken areas are not only inconvenient to pedestrians; they may actually be dangerous, and the property owner and the municipality may be held jointly liable for accidents caused by defective sidewalks.

Other contractors have found that there is also a need in many municipalities for an ordinance governing sidewalk construction and maintenance. By promoting such ordinances these contractors are enlarging the market for high quality concrete sidewalks.

Winter selling of sidewalks means a larger volume of business in the spring.

Working with Architects

By becoming acquainted with both residence and landscape architects, concrete contractors are able to promote more concrete work. As previously discussed, there are countless uses for concrete around the home, and it is to the contractor's advantage to have architects specify his material. The contractor who has successful dealings with architects is the one who convinces this group that he can make concrete meet the architectural requirements, whether the job be a house or a garden. Both residence and landscape architects are busy in the winter making plans for work to be done in the summer. The progressive concrete contractors, therefore, endeavor to work with the architects and get their material—concrete—specified for the impending jobs.

Winter Selling Brings Spring Profits

There are undoubtedly other contacts being made every winter by progressive builders in their efforts to get spring business. However successful a contractor is in the spring usually can be attributed to the pre-selling and actual selling he did during the winter. It pays to make friends with those people who can specify concrete for this and that job. The contractor who has a large program of work laid out for the spring undoubtedly was busy all winter getting the contracts.

Selling Garages and Driveways

A Field That Offers an Excellent Market for Progressive Concrete Builders

IN selling garages the builder must be able to offer structures that will satisfy three essential requirements: first and most important, security against fire; second, protection against the weather; third, reasonable convenience in use and maintenance. The automobile owner can be shown that the amount of money invested in the average motor car justifies a garage that will meet these requirements. Likewise, the owner can be convinced that a garage which provides all of these features is the most economical in the long run.

Prospect List

However, before the concrete builder can attempt to sell garages that meet the foregoing requirements he must have a list of prospects. Where can this list be obtained? One method that has proved satisfactory is to contact the local automobile dealers and get the names and addresses of new car buyers. This list can also be supplemented by getting names of automobile owners from agents who handle automobile insurance. A survey of the community will also give a fairly complete picture of the local garage and driveway requirements. Why not make a tour of your city or town or hire a salesman to do it? Such an inspection trip will reveal that many garages are dilapidated, fire hazardous structures; that countless driveways are full of ruts and, in wet weather, practically impassable; that many persons park their cars in the yard or street. However well the garage builders may have served the market, there is always a need for more garages and driveways. That is, this field is practically untouched, offering the concrete builder an excellent opportunity for doing a profitable business.

Personal Selling

There are several ways in which the garage and driveway prospects can be reached—newspaper advertising, direct-mail and personal selling. The latter is the most effective, yet the others are helpful. For example, if the prospect has read your advertisement in the local newspaper or has received a booklet describing the kind of garages you build, this will simplify the work of your salesman. Newspaper advertisements, direct-mail pieces and the sales talk of your representatives should carry the same message. The following facts regarding garages can be used in preparing your sales message whether it is delivered by the newspaper, the mail man or a salesman:

Whether it be for a small one- or two-car garage or a large community structure, concrete is the preferred construction material. The concrete garage not only satisfies all of the important requirements—security against fire, protection against the weather and reasonable convenience in use and maintenance—at minimum first cost, but it has the additional merits of long life, low maintenance and ready adaptability to almost any architectural treatment.

Garages Should Be Fireproof

Perhaps the greatest single advantage in the use of concrete as a construction material is its great fire resistance. A garage which increases the fire risk is a menace. The owner may rest assured that his car has maximum fire protection when it is housed in a concrete masonry garage. In addition to the fire hazard common to all buildings the garage has a hazard of its own due to the presence of gasoline and oil which makes it of vital importance that the garage be firesafe.

In many cities building regulations require that structures of flammable construction be built some distance from the lot line but allow fireproof buildings to be built to the lot line. Thus on narrow city lots or where it is desirable to build the garage as a part of the house, fireproof concrete construction has a decided advantage.

Roof as well as walls should be of non-burnable construction to give complete fire protection and this is obtained through the use of concrete roofing tile or cement asbestos shingles. Either of these materials may be obtained in a number of attractive colors to blend with the color scheme of the walls.

Added to the economies resulting from fireproof construction there are other features about a concrete garage, which result in tangible savings for the owner. Maintenance costs are practically eliminated. There are no bills for painting except an occasional renewal of paint on window frames, sills and trim.

In whatever location the garage is placed it usually appears in a general view of the house and should therefore be an attractive structure that will add to the beauty of the surroundings. Sharp contrast between the design of the house and garage should be avoided. To secure unity of appearance some predominating feature in the house design is often incorporated in the lines of the garage. One of the outstanding advantages of concrete masonry is the ease with which it lends itself to almost any architectural treatment. With portland cement stucco—the method of surfacing concrete masonry garages—an almost endless variety of colors and surface finishes is possible.

Sell the Driveways, Too

When the builder is selling garages he should not overlook the concrete driveway market. The home owner can be shown that a durable, year 'round driveway will improve the exterior appearance of the home and its surroundings. The following facts will be helpful as sales aids in developing concrete driveway business:

There have been several types of concrete driveways developed and the choice is largely dependent upon how the driveway is to be used. Where subjected to hard service, concrete pavement covering the entire driveway area gives the best satisfaction. Parallel strips of concrete, each at least 30 inches wide, with a strip of lawn between, often provide satisfactory approach where the driveway is subjected only to occasional use. However, in this type of driveway, the runways should always be built with curbs on the outer edges. This protects the lawn and shrubbery from carelessly driven vehicles.

The Man Without a Garage

By WILLIAM M. KINNEY

General Manager, Portland Cement Association

I am "the man without a garage."

Although I have been a prospect for a garage for a number of years, no one has ever made an attempt to sell me one nor has anyone ever tried to promote me to have one built. Yet I drive an automobile regularly and keep it in a rented garage paying $20 a month for this service—$240.00 a year.

In the press of other matters I have not taken the time or trouble to find a contractor who could build the kind of garage I would like to own. However, I am certain that if a live-wire builder came to me and said, "Mr. Kinney, a garage will save you money and prove a great convenience and I can build just the kind of structure that will enhance the appearance of your home grounds," I would give him the contract. If this up-to-date builder had such sales aids as photographs of attractive, permanent, firesafe garages he has built and plans for garages that might suit any needs, his sales efforts would be aided materially. In fact, a live-wire builder of this type could even convince me that I should accompany him and inspect some of the garages he has built.

I believe there are hundreds of other automobile owners in much the same position as I am; they are "men without garages." There is a market for garages everywhere, and this business is available for the live-wire builder.

Building driveways to garages offers an even greater opportunity for the alert contractor. There are countless garages without a respectable all-weather approach from the street. Through indifference and procrastination on the part of the owner and due to the lack of initiative on the part of the contractor these driveways are at best make-shift, unsightly and in some seasons, a practically impassable passageway for the car.

Can you imagine an insurance salesman or a stock salesman who would overlook such golden opportunity? Were salesmen from either of these two groups to hear that I could possibly be persuaded to take out more insurance or could be interested in a stock purchase, I would be given no peace. Now that I have so openly announced that I am in the market for a garage, I presume I shall be besieged with contractors seeking the job. It remains to be seen. In the meantime I am paying storage charges on my car.

To Conduct Research Study of Farm Structures

A research study of farm structures to be conducted by the United States Department of Agriculture will be directed by Prof. Henry Giese of Iowa State College, Ames, Iowa, who has been appointed by the Secretary of Agriculture to the staff of the Division of Agricultural Engineering in the Bureau of Public Roads.

The study will cover the fundamental requirements of farm buildings of all kinds and the best and most economical methods of meeting them. Farm buildings, as they exist today, are the result of a following of precedent without regard for the particular requirements of a particular structure nor for economy in the use of space and materials, according to the Division of Agricultural Engineering.

The American Society of Agricultural Engineers called attention to the need of more concentrated attention to farm structures research and asked the secretary to take up this subject.

It is hoped to enlist the aid of the agricultural colleges in undertaking and carrying to completion a correlated series of investigations.

Paved Parking Areas Bring Full Motoring Utility and Congestion Relief

Whether going or coming or not going at all, the automobile occupies a certain amount of space. Oddly, the motorist frequently experiences the greatest difficulty in finding this space when he wants to park. Somehow or other parking spaces always seem to be filled, or else two curt words on a signboard compel him to move on.

Sedans are no longer buggies and the space once devoted to the "hitchin' rail" is inadequate. Parking in city and town today is no small problem and unfortunately little has as yet been done by municipalities to create open air stopping places for cars. The parking problem is no joke—and one answer to it is found in a new facility, the establishment of paved parking areas, such as every concrete builder can construct.

In Chicago, the Lincoln Park Board is making an effort to unscramble its traffic situation by constructing two concrete parking spaces. These will be 320 ft. long by 130 ft. wide, accommodating 300 cars. At Coney Island there is a concrete parking space 1,350 ft. long by 705 ft. wide, large enough to accommodate more than 5,000 cars.

A fair sized city in Illinois realized that it was not getting its share of rural business. Farmers were going elsewhere to do their buying. City officials and business men conferred. Shortly a group of old buildings was torn down and a spacious parking place was provided. Not content with this, the city built a new bridge across a stream which had always been a traffic barrier.

Concrete Contracting in the "Nineties"

This is a "way back when" story of the experience of J. N. Dugan of the Dugan Concrete Company, Cincinnati, Ohio, whose father laid the city's first concrete walk in the "roaring nineties." While some of the owners welcomed the advent of enduring sidewalks, Mr. Dugan also visualized other uses for concrete.

Contractors permitted him to use concrete for porch piers and steps, but did not allow it in the basement walls. Questions regarding its strength, waterproofness, and structural qualities came up. It took Mr. Dugan two years to answer them to the satisfaction of all the contractors and convince them that concrete was a suitable material for foundation work.

When at last the first job was open to concrete, the contractor would not permit 8-in. walls. It was necessary to build the rubble-stone walls 18-in. thick and the same thickness of concrete was specified for an eight-room house! Today the job is still standing and there is no trouble from dampness.

On this 18-in. foundation wall the Dugan Concrete Company has built a creditable business in concrete contracting. That job was their first bit of quality concrete construction, and the business now is flourishing.

Building Garages and Driveways

Information on Design and Construction of One-Car, Two-Car and Multiple Car Garages—Facts for the Builder of Concrete Driveways

THERE are really three distinct types of home garages in demand today—the one-car, the two-car and the multiple car garage. Several suggested designs for each of these types are shown in the accompanying drawings.

The one-car garage, as its name implies, is for the car owner who desires a private shelter for his car on the home grounds. Of the four designs shown for this type, plans for those in the upper and lower left hand corners are available. The minimum inside dimensions for a one-car garage are: width, 12 ft.; length, 20 ft. In the typical floor plan shown, the outside dimensions are given as 13 ft. 4 in. wide and and 21 ft. 4 in. long. Allowing for the thickness of the concrete masonry walls, this plan meets the minimum requirements for size. For a one-car garage the minimum width of doorway is 8 ft.

General Construction Information

In all garages, whether they be one-car, two-car or multi-car, there should be a clearance of 8 ft. between the concrete floor and eaves of the roof above the main doors. Generally, at least 9 ft. 4 in. is allowed between the ceiling and the floor.

Concrete footings for garages should be placed below the frost line and they must rest on firm soil. A cinder or gravel fill should be placed for the concrete floor and the minimum thickness of the floor is 5 in. An approach or apron is usually built from the driveway or alleyway to the garage. It should have a slope of 4 in. in 3 ft., the distance it extends away from the garage. The width of this apron for a one-car garage is 8 ft.; for a two-car garage, 16 ft. For multiple garages, of course, the width depends upon the number of garages in the series. All garage floors should slope to a drain placed in the center. It is well to provide sufficient windows for ventilating purposes. This is especially desirable in view of the deadly effect of carbon monoxide gas which escapes with the exhaust fumes from automobiles.

An all-concrete garage consists of concrete floor, concrete masonry and portland cement stucco walls, concrete sills and lintels, concrete roofing tile or cement-asbestos shingles and a ceiling of portland cement plaster on metal or wire lath.

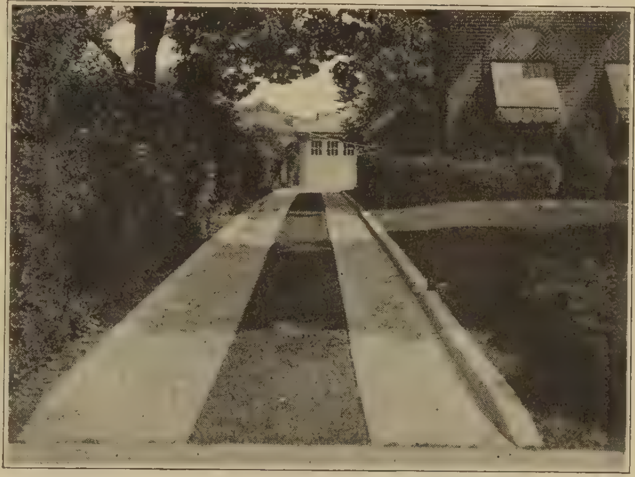
Two-Car Garages

Garages constructed to provide storage space for two cars have become popular with thrifty owners. The cost per car of building a garage for two cars is relatively less than for a one-car garage, and the extra space over that required by the owner ordinarily can be rented at a substantial profit. The rental received usually is more than sufficient to cover interest charges, taxes and other expenses on the entire structure, giving the owner storage space for his car at practically no cost and often giving him considerable cash return as well. For the owner of a single car who prefers not to rent out space, the double garage is still a good investment, providing a handy workroom and furnishing accommodations for visiting cars—a mark of hospitality that is appreciated.

A width of 10 ft. should be allowed for each car. A length of less than 20 ft. is seldom advisable and for larger cars 22 ft. to 24 ft. is not too much. The convenience of the extra space is worth many times the slight additional cost of building the garage 2 or 4 ft. longer. For a two-car garage, the minimum width of doorway is 16 ft.; or, if two entranceways are provided, each should be not less than 8 ft. wide.

Multiple Car Garages

The community or multi-car garage is rapidly gaining popularity in the more densely populated residential sections of our larger cities. In principle, the multiple car garage resembles a number of single car garages placed side by side with heating arrangements and other facilities in common. It provides stalls where the automobiles can be cleaned, lubricated and repaired by the owners if desired. In each stall sufficient space is generally provided for the storage of supplies and each has its own doors, lights, water pipes and lockers. The community garage often represents the most economical use of space for automobile storage purposes and in many localities offers an excellent opportunity for investment. By selecting a good design, such as those shown in this article, and by paying careful attention to the planting of vines and shrubs the community garage can be made sufficiently attractive to be unobjectionable even in the most exclusive residential sections. Multiple garages are also satisfactory and in common use for housing automobiles owned by those who dwell in apartment buildings.

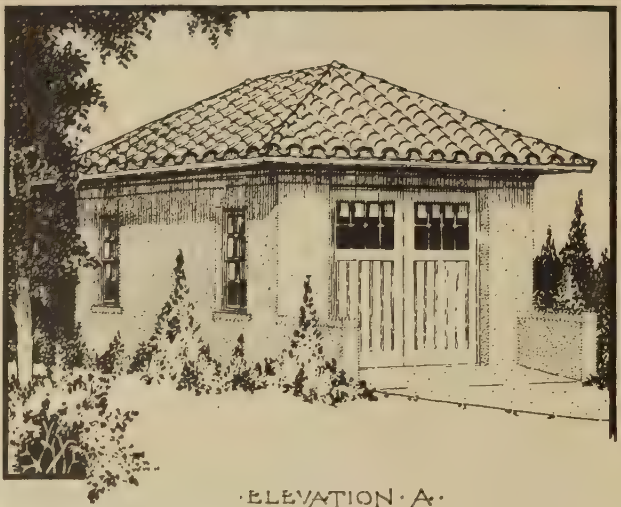


The curbs on this concrete driveway protect the lawn and shrubbery from carelessly driven vehicles

For each unit of a multiple garage, the essential requirements for a single car garage should be followed.

Building Concrete Driveways

The function of the private driveway is similar to that of the street pavement to which it leads. In fact, the driveway is a pavement and, as such, it should be designed to give the service expected of it. It must be built strong enough to carry both the weight of the home owner's own automobile and the heavy loads of coal and other supplies which are hauled over it from time to time.



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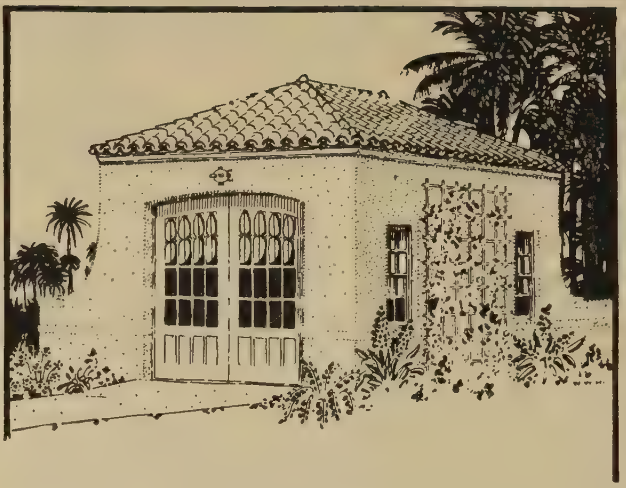
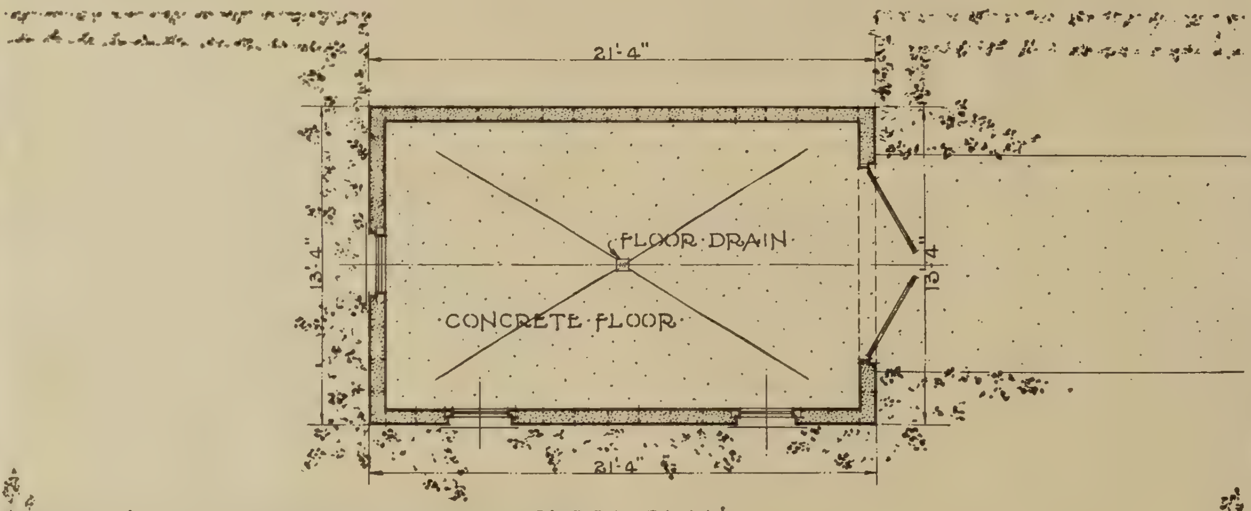
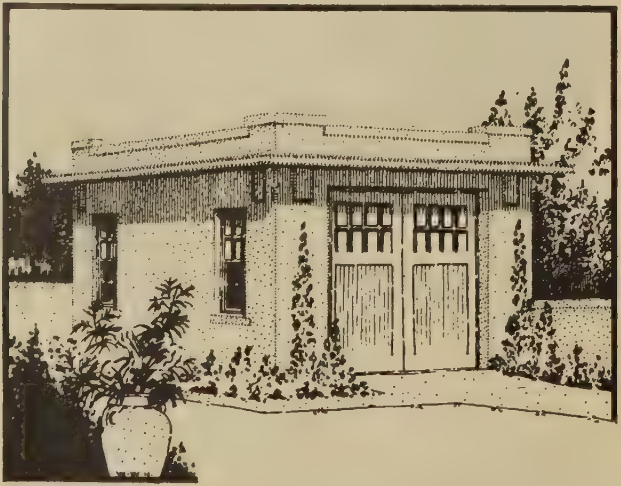


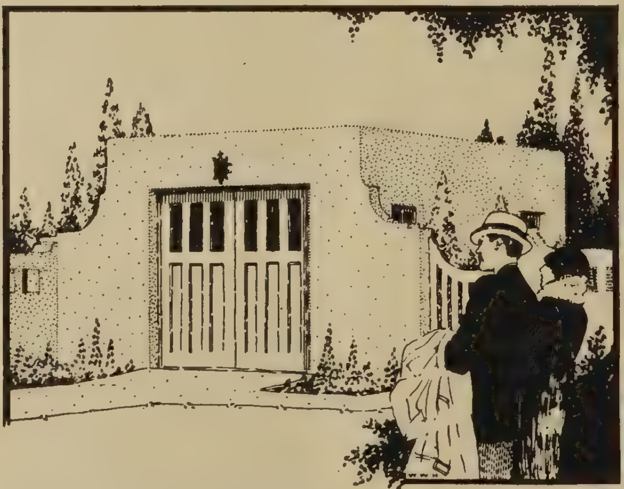
·ELEVATION·B·



·FLOOR·PLAN·



·ELEVATION·C·



·ELEVATION·D·

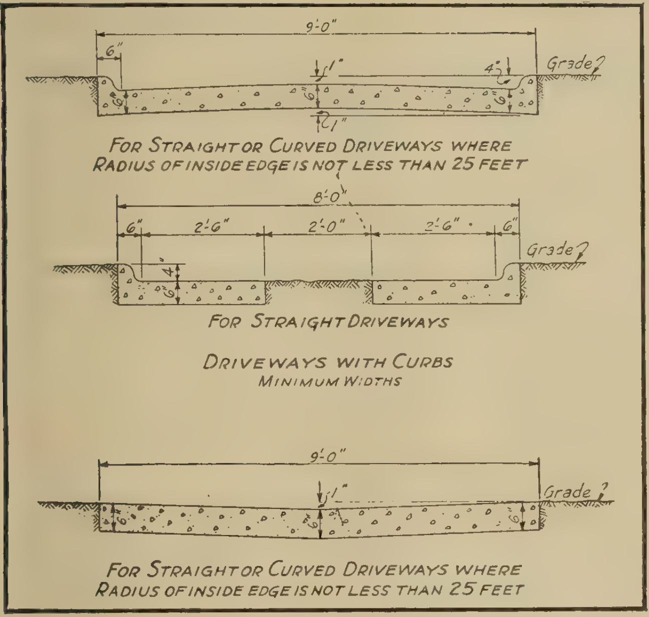
·ONE·CAR·GARAGE·

·CONCRETE·FOR·PERMANENCE·AND·FIRE·SAFETY·
·PORTLAND·CEMENT·ASSOCIATION·33·WEST·GRAND·AVENUE·
·CHICAGO·ILLINOIS·

In general, there are two types of private driveways in common use; those having a concrete pavement over the entire driveway area and those having two separated parallel strips each of sufficient width for the wheels of a vehicle to pass over. Each of these types may be built with or without curbs, although it is recommended that curbs be used with the latter type. The curbs protect the lawn and shrubbery from carelessly driven vehicles.

Width of Pavement

The width of the driveway will vary according to its location on the property or the width of ground available. The minimum width recommended, however, is 8 ft. of clear roadway space except where drives consist of two parallel strips with curbs. The maximum clear width in this instance is 7 ft. This width permits the wheels on one side of a vehicle to travel along the curb without danger of the wheels on the other side running off and forming ruts in the grass plot between the parallel strips of concrete. With other types, more convenient passage may be obtained by increasing the width to 9 or 10 ft. if conditions will permit.


9'-0"
6"
1"
4"
Grade
6"
1"
FOR STRAIGHT OR CURVED DRIVEWAYS WHERE RADIUS OF INSIDE EDGE IS NOT LESS THAN 25 FEET
8'-0"
6"
2'-6"
2'-0"
2'-6"
6"
Grade
4
6
FOR STRAIGHT DRIVEWAYS
DRIVEWAYS WITH CURBS
MINIMUM WIDTHS
9'-0"
1"
Grade
6
6
6
FOR STRAIGHT OR CURVED DRIVEWAYS WHERE RADIUS OF INSIDE EDGE IS NOT LESS THAN 25 FEET

Three concrete driveway designs

Surface of Pavement

The surface of the driveway pavement should be crowned to a height of one inch at the center to provide for the free drainage of water from its surface. Where it is possible to obtain a sufficient grade the crown may be inverted, or depressed in the center to a depth of one inch. In this case surface water is carried off along the center of the driveway.

A variety of colors may be produced in concrete driveway pavements. Likewise, marking, flagging or other decorative surface treatments to contrast or blend in color with other buildings and structures on the premises may be fashioned. In fact, concrete driveways may be built to satisfy any distinctive expression of color or harmony desired by the owner.

Thickness of Pavement

A 6-in. thickness is recommended for all concrete driveways. This thickness is sufficient to carry the truck loads of coal and other commodities which may be hauled over the driveway from time to time. Care should be taken to see that the area upon which the pavement is to lay is well compacted and brought to grade before any concrete is placed.

Curbs should be at least 4 in. high and not less than 4 inches and preferably 6 in. in width.

Construction Information

One-course construction is recommended, using the same mixture of concrete throughout. With moist sand and pebbles, the correct mixture is 4¼ gallons of water for each sack of cement. To this add sufficient amounts of sand and gravel or crushed stone in the proportions of 2 parts sand and 3 parts coarse material until the mixture is rather stiff. Finishing should be done with a wood float, producing a smooth yet gritty, non-skid surface.

Showing another concrete driveway with protective curbing

Expansion joints, ¼ in. in width, should be constructed transversely across the pavement at 20-ft. intervals and longitudinally wherever the concrete slab exceeds 15 ft. in width. Likewise, expansion joints should be provided between the curb return* and the street pavement, along both sides of the sidewalk where the driveway crosses and along all stationary structures such as garages, walls, house foundations, retaining walls and stairway units which come in contact with the driveway.

Because of the relative narrowness of strips often used for concrete driveways, it is recommended that "dummy" joints, 2 in. deep, be formed between the expansion joints at 5-ft. intervals. These joints create a plane of weakness in the concrete strip causing any cracks which may form to take place at regular intervals beneath the "dummy" joint and below the surface of the drive. "Dummy" joints are easily formed by means of a double edging tool having approximately a 2½-in. flange in the center. In making the joint, the edger is run along a thin wooden strip laid over the concrete at the location of the joint. Where curbs are used in connection with the driveway, the "dummy" joints should be cut through them as well.

Curing Concrete Driveways

Damp earth, sand or straw is used to cure the concrete after it has hardened sufficiently so it is not easily marred. This covering must be kept moist for a week, sprinkling as often as necessary, and the driveway should not be put in service until the concrete has hardened for two or three weeks.

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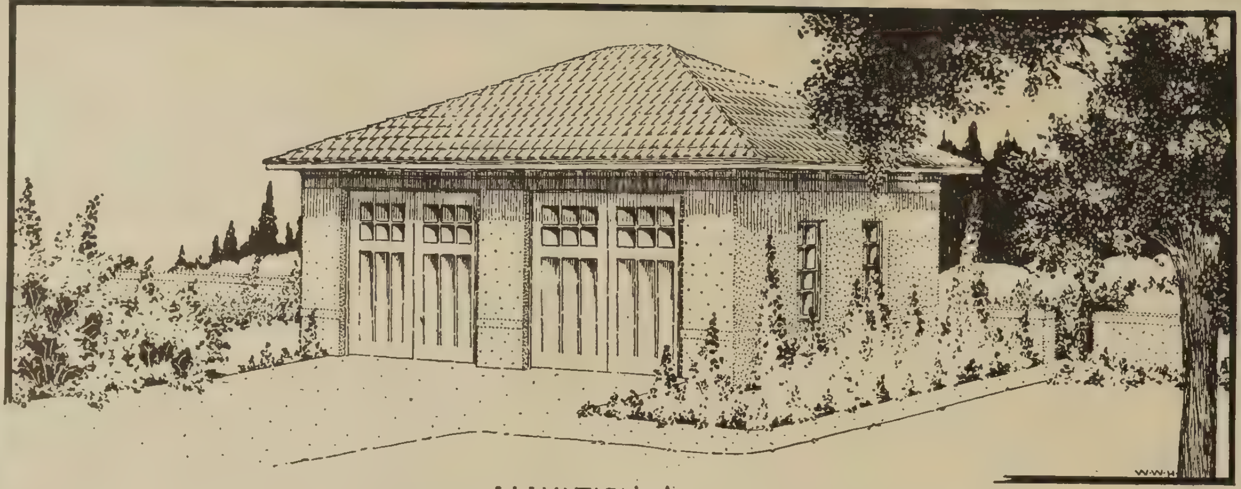
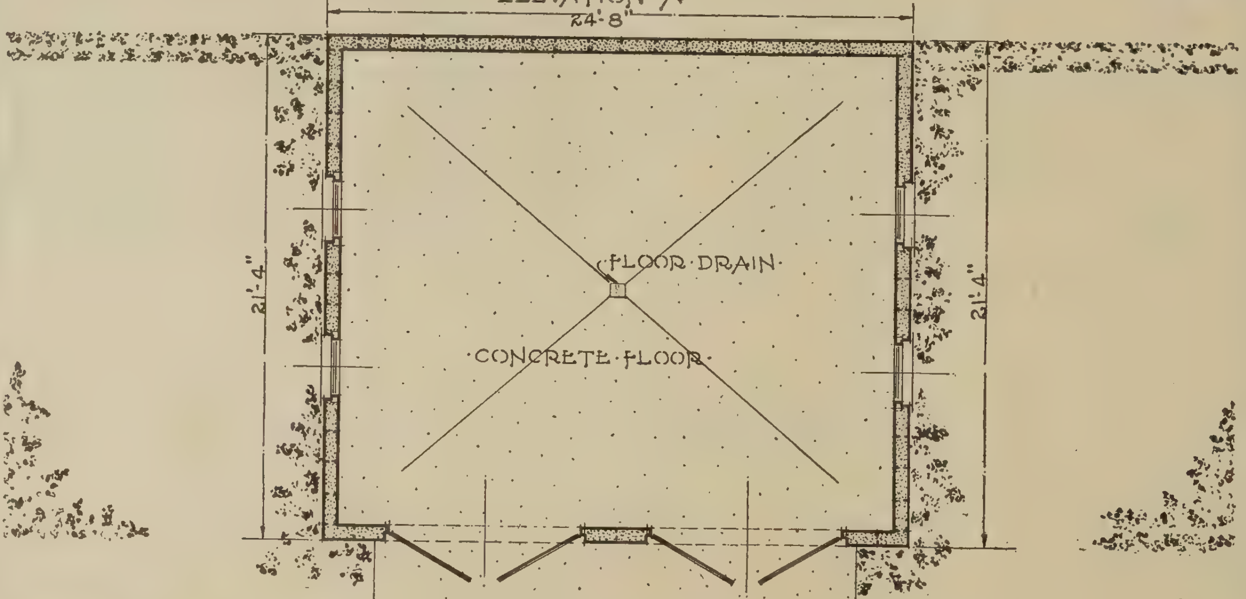
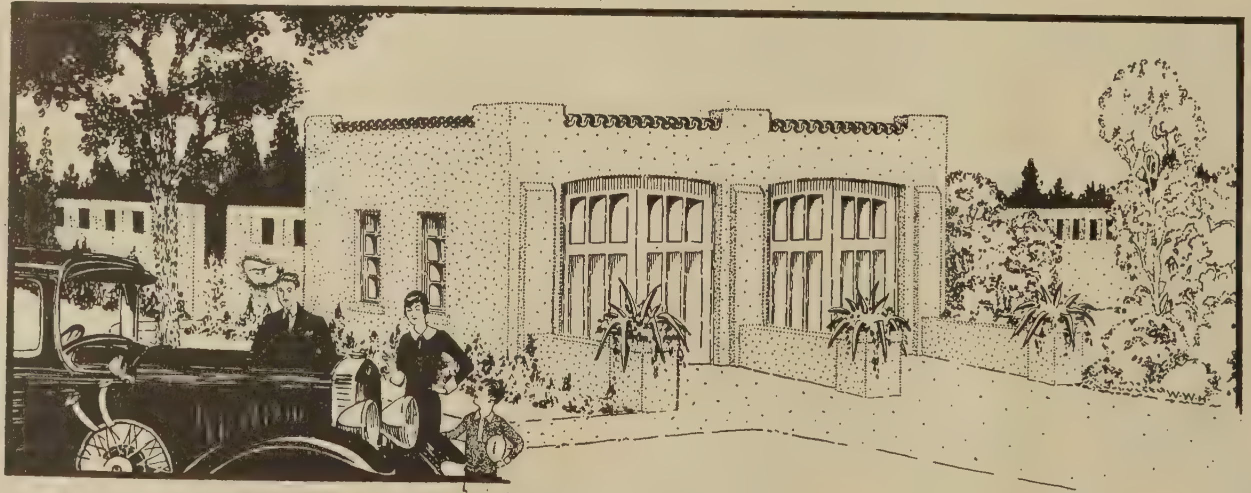
*Editor's Note:—An article on the function and design of curb returns will be published in an early issue.



ELEVATION A



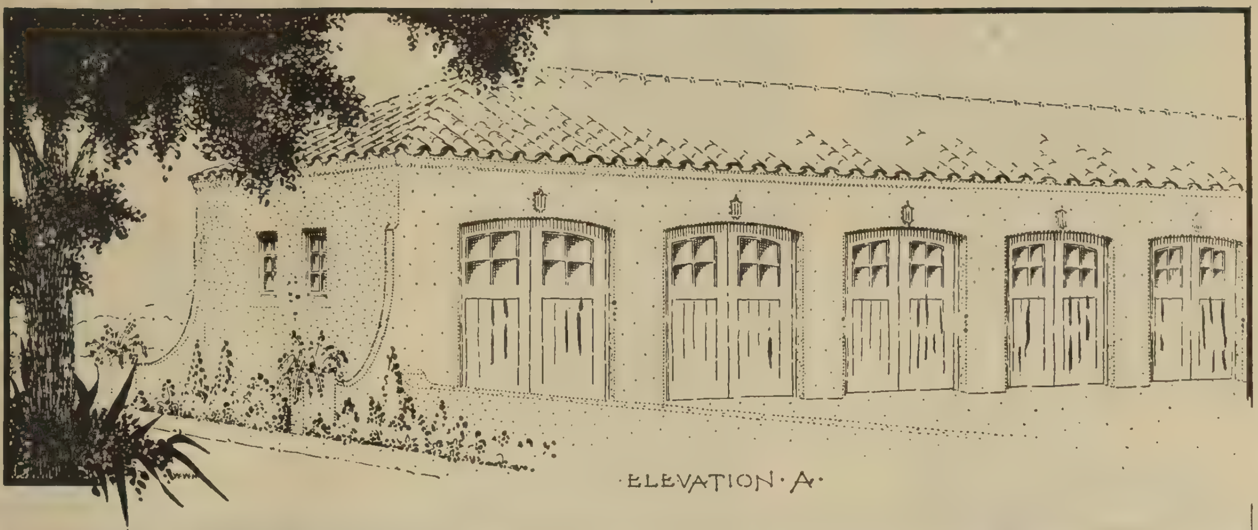
FLOOR PLAN



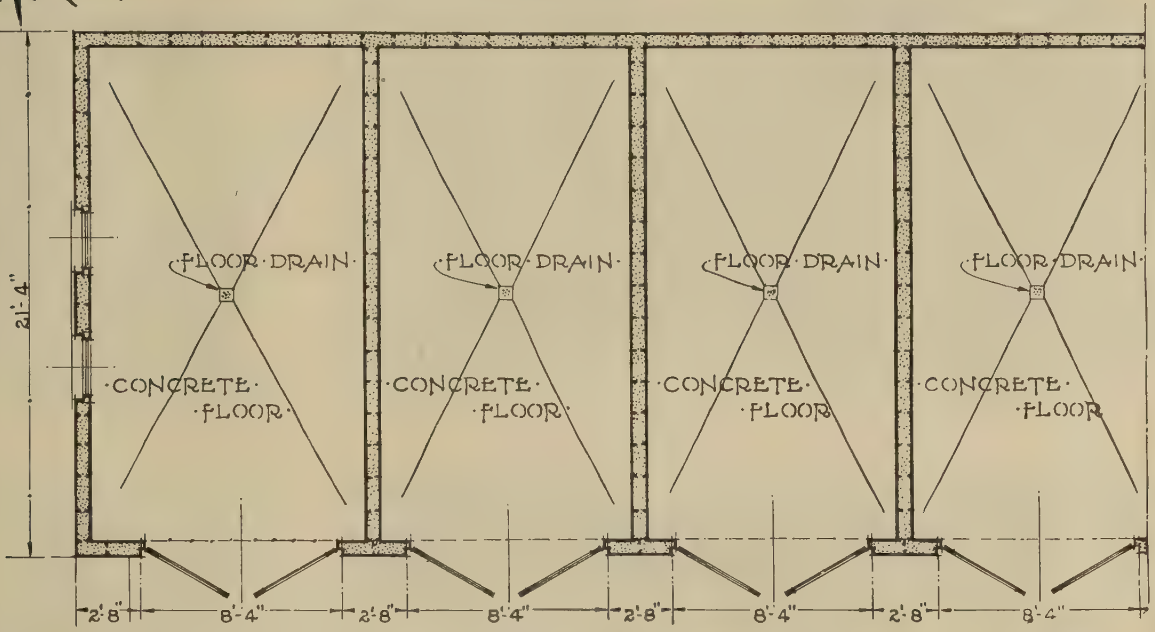
ELEVATION B

TWO CAR GARAGE

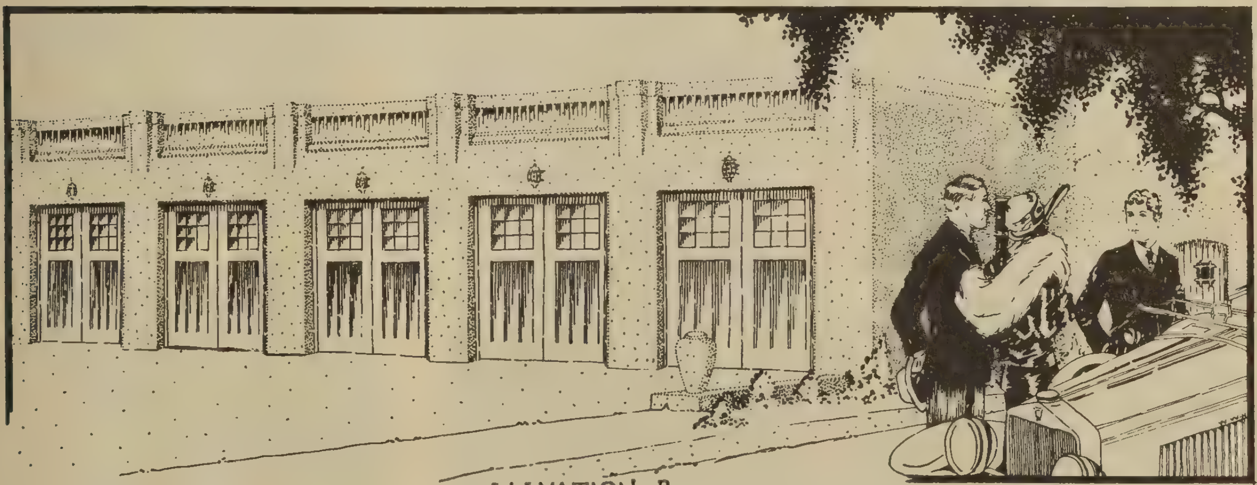
CONCRETE FOR PERMANENCE AND FIRE SAFETY
PORTLAND CEMENT ASSOCIATION 33 WEST GRAND AVENUE
CHICAGO ILLINOIS



·ELEVATION·A·



·FLOOR·PLAN·

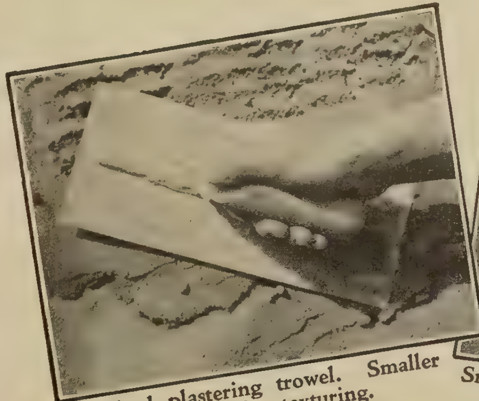


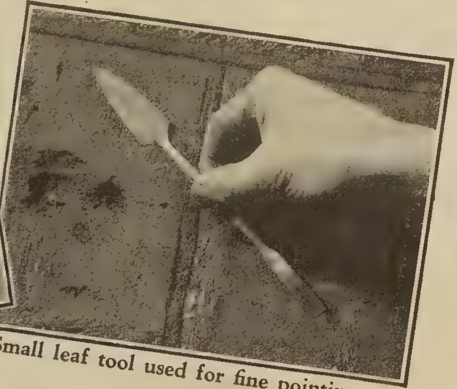
·ELEVATION·B·

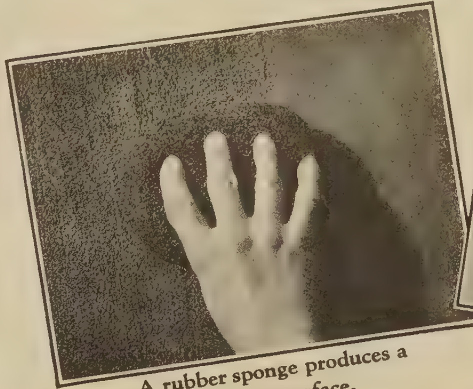
·MULTIPLE·CAR·GARAGE·

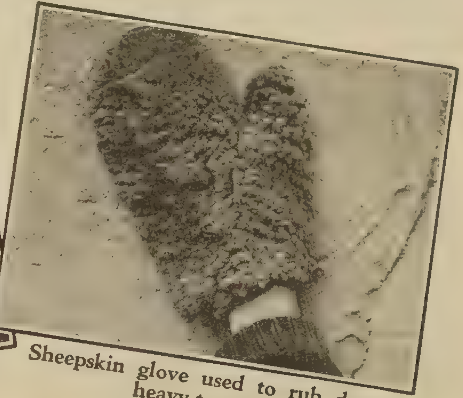
·CONCRETE·FOR·PERMANENCE·AND·FIRE·SAFETY·
·PORTLAND·CEMENT·ASSOCIATION·33·WEST·GRAND·AVENUE·
·CHICAGO·ILLINOIS·

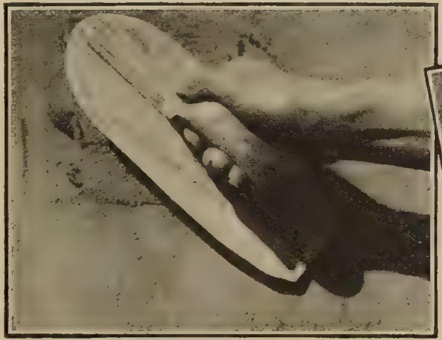
Plastering and Texturing Tools

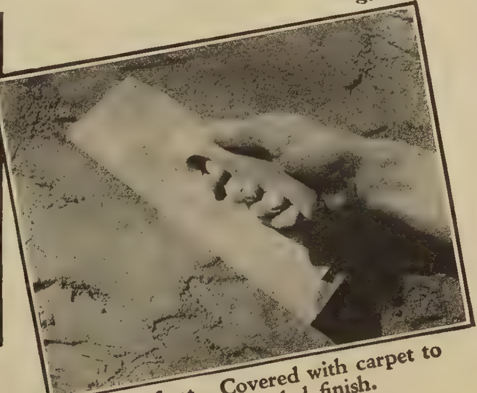

Standard plastering trowel. Smaller size used for texturing.

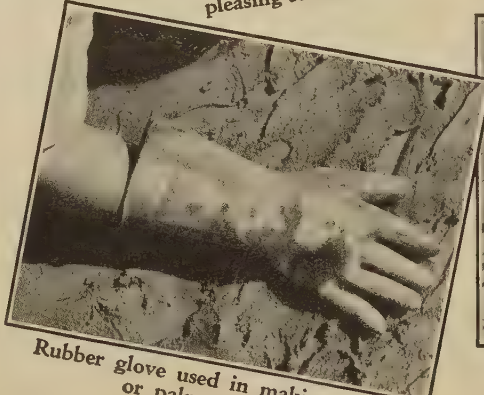

Small leaf tool used for fine pointing.

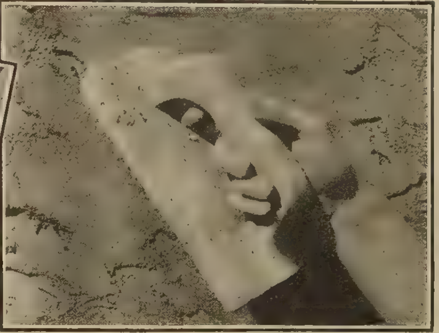

A rubber sponge produces a pleasing surface.

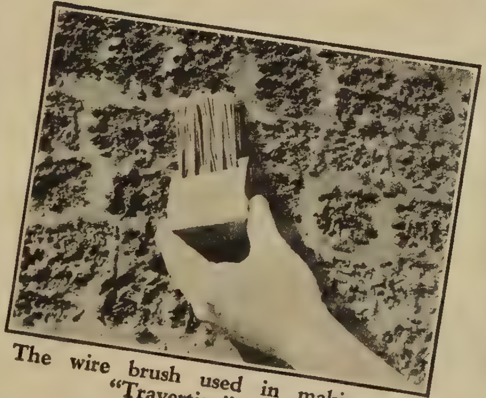

Sheepskin glove used to rub down heavy textures.

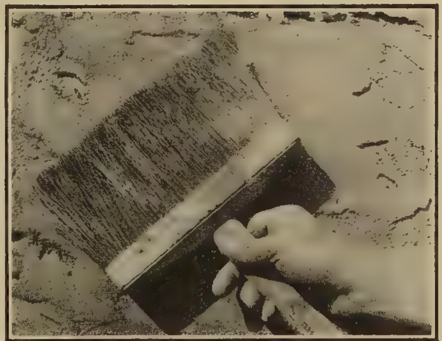

A round point trowel.

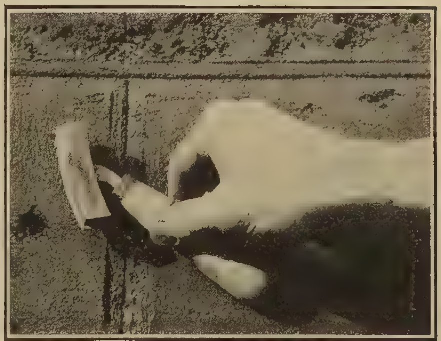

Wood float. Covered with carpet to produce sanded finish.

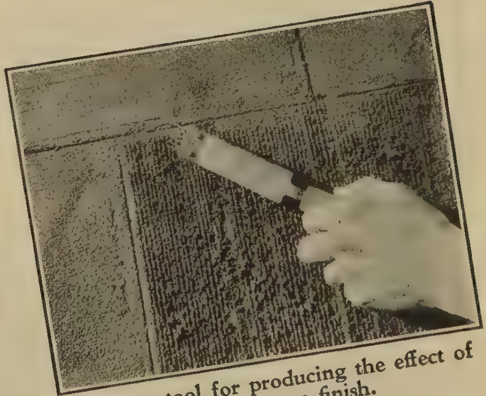

Rubber glove used in making hand or palm textures.


A cork float.


The wire brush used in making the "Travertine" texture.


The Dutch brush used for applying washes or for softening rough textures.


The jointing tool for marking off surfaces to resemble masonry.


Combing tool for producing the effect of a tooled stone finish.

Modern Stucco and Plaster

A Discussion of Standard Practice in Application of Portland Cement Stucco and Plaster

Typical Portland Cement Stucco Textures—Common Plastering and Texturing Tools

(Installment IV)

CRAFTMANSHIP determines the beauty of a stucco finish. This article, therefore, is devoted to a discussion of the various steps required in developing typical portland cement stucco textures. This how-to-do-it information is expected to aid the plasterer in acquiring the correct technique of texturing.

Tools to Be Used

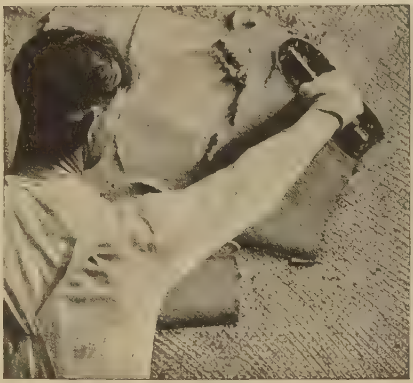
Plastering and texturing tools which are regularly used in the application of portland cement stucco are shown in the illustrations shown on the preceding page.

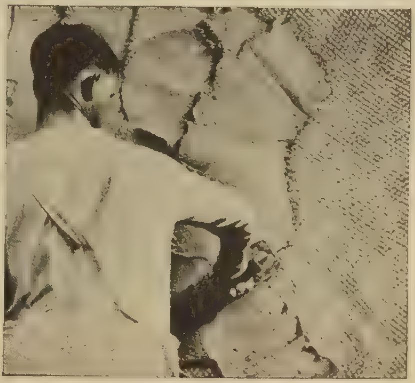
Spanish Texture

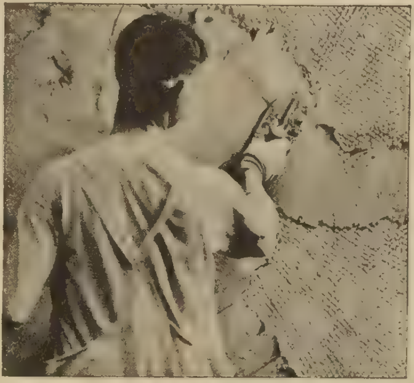
The stucco is applied in fairly heavy layers when creating this texture. A full trowel of mortar is used for each stroke. Strokes of the trowel are made in all directions, being curved and varied to form rolling ridges and hollows in the finished surface. A trowel with rounded corners is used so that straight-line markings will not appear in the finish. Best results are secured with a fairly stiff mortar. Uniform dampening of the brown coat aids in the spread of the finish, helping to make the mortar stand as placed by the trowel.

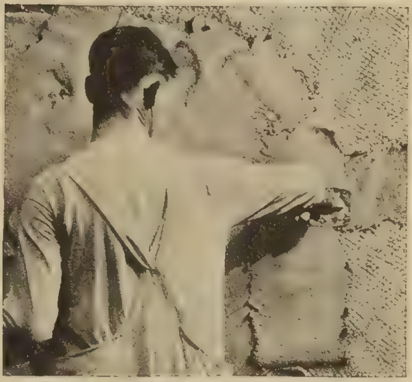
How Effect Is Gained

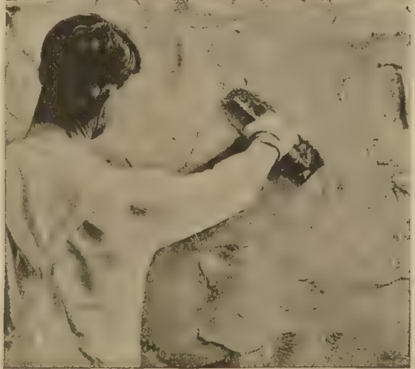
The wall should not be soaked, however, so that water stands on the surface. Before the mortar hardens to a point where it has lost its workability, the rough edges are smoothed out with a round-point trowel. This operation forces projecting sand particles into the mortar, tending to compact the stucco and close the surface pores, yet leaves the wavy effect necessary to a Spanish texture. Excessive troweling should be avoided.

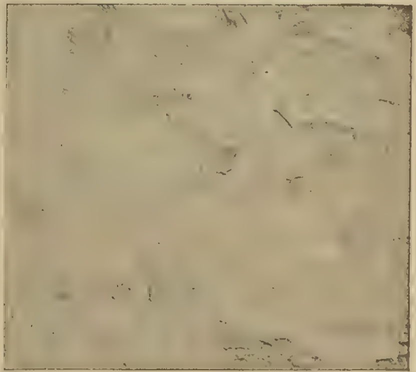

1. Using a round point trowel


2. Strokes in all directions


3. A left horizontal stroke


4. Irregular overlapping


5. Finishing with the trowel


6. A wavy, trowel-marked finish

Showing methods used in applying stucco for Spanish texture

OTHER TEXTURES

In the December issue instructions for applying the Modern American texture, the English cottage texture, the Italian texture, and the California texture will be described and illustrated.

The series will conclude in the January issue with complete specifications for applying portland cement stucco and plaster on all the recommended types of bases.

Getting Garage Business

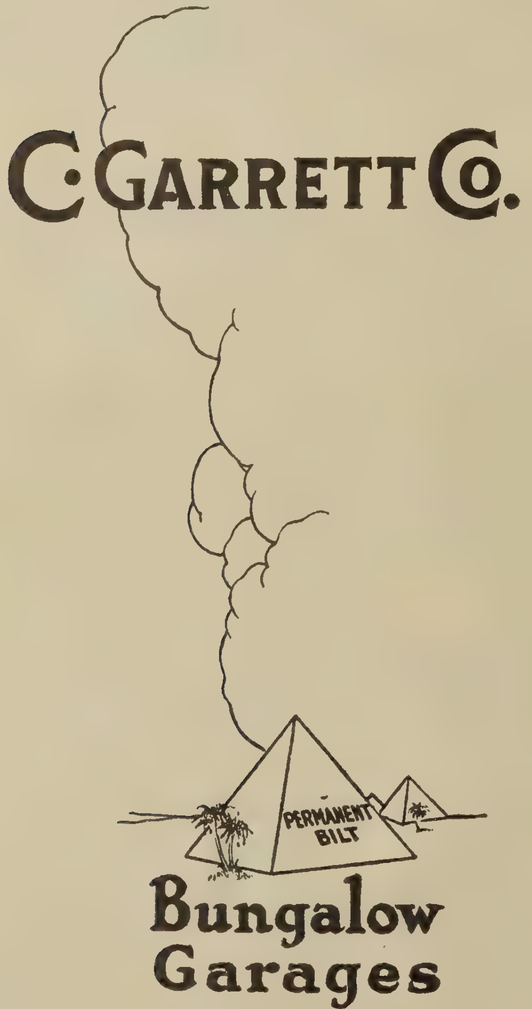
C. Garrett Company of St. Louis Specializes in Garage and Concrete Driveway Construction—Business Built on Service and High Quality Workmanship

SELLING garages and concrete driveways by mail is the principal method used by the C. Garrett Company of St. Louis, which specializes in these two types of construction. In the foreword of his booklet, the front cover and two pages of which are shown here, Mr. Garrett delivers the following message to his prospective customers:

"Your good will and recommendations are most valuable assets to the C. Garrett Co., and as such cannot be bought, but must be obtained through service. We recognize our obligation to give you the highest quality and service.

"This catalog has been prepared so that you may readily understand that quality is built into Garrett Permanent-Bilt buildings. After many years of practical experience exclusively devoted to building garages, we feel that we are able to give you the utmost in value and the best service because we are specialists in this line.

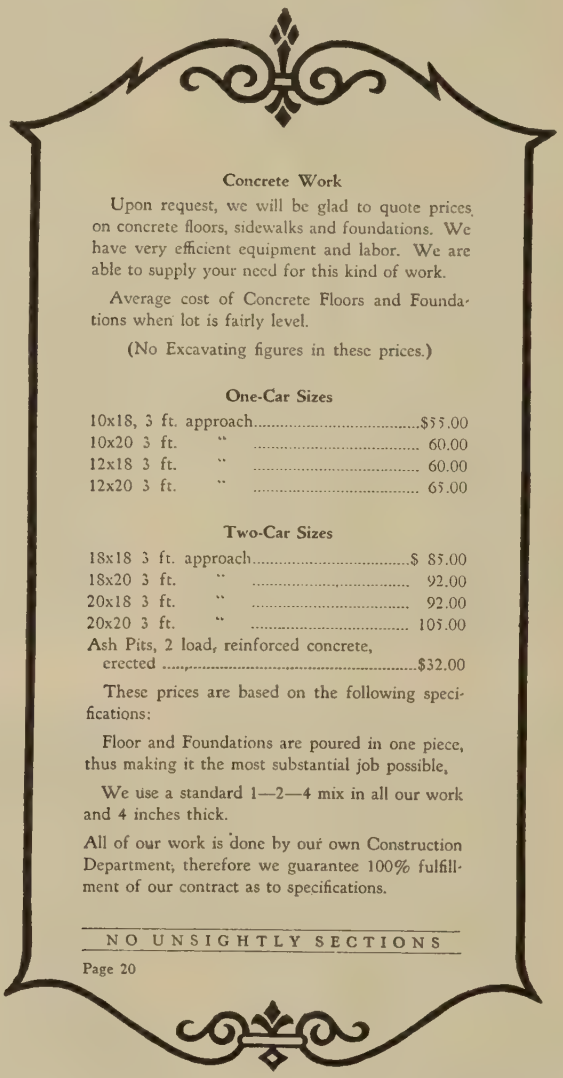
"When you take advantage of our experience as practical builders, we feel sure that you will be another added to our list of satisfied boosters for C. Garrett Company."



C. GARRETT CO.

Bungalow Garages

Booklet mailed to prospects by C. Garrett Company, St. Louis, in selling garages and concrete work



Concrete Work

Upon request, we will be glad to quote prices on concrete floors, sidewalks and foundations. We have very efficient equipment and labor. We are able to supply your need for this kind of work.

Average cost of Concrete Floors and Foundations when lot is fairly level.

(No Excavating figures in these prices.)

One-Car Sizes	
10x18, 3 ft. approach	$55.00
10x20 3 ft. "	60.00
12x18 3 ft. "	60.00
12x20 3 ft. "	65.00

Two-Car Sizes	
18x18 3 ft. approach	$ 85.00
18x20 3 ft. "	92.00
20x18 3 ft. "	92.00
20x20 3 ft. "	105.00
Ash Pits, 2 load, reinforced concrete, erected	$32.00

These prices are based on the following specifications:

Floor and Foundations are poured in one piece, thus making it the most substantial job possible.

We use a standard 1—2—4 mix in all our work and 4 inches thick.

All of our work is done by our own Construction Department, therefore we guarantee 100% fulfillment of our contract as to specifications.

NO UNSIGHTLY SECTIONS

Page 20

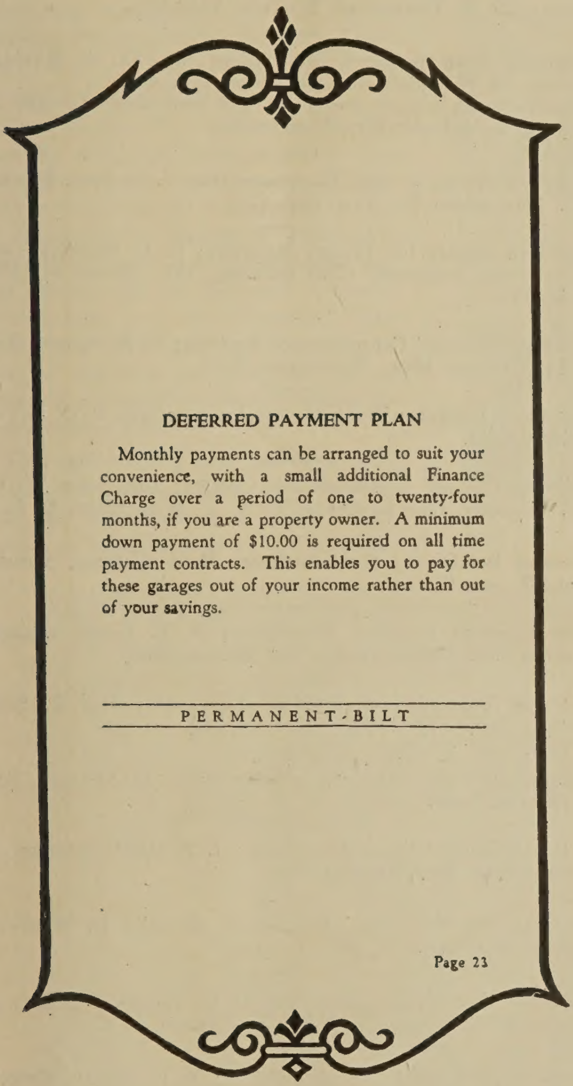
Page 20 of C. Garrett Company's direct-mail booklet describing concrete work and giving price list

Personal Selling Follows Mailings

As already indicated, Mr. Garrett's practical method of selling is through direct-mail advertising. This includes distribution of the booklet to live prospects and these mailings are followed up with personal calls by salesmen. Lists of live prospects are obtained from various sources, including previous customers; automobile dealers, who supply lists of new car buyers; canvassing neighborhoods where investigation shows that many car-owners need garages, and calls on property owners in sections of St. Louis where streets and alleys are being improved. Every prospect is mailed a copy of C. Garrett Company's booklet, "Permanent-Bilt Bungalow Garages," illustrating a type of garage to suit practically every purpose.

Another method used to develop garage and concrete driveway business involves calls on home owners in the vicinity of a garage job. The job on which one of the C. Garrett Company's crews is working is used as an advertisement, as a sales aid.

In selling a prospect Mr. Garrett's principal sales argument is based on the fact that a garage offers the utmost in convenience to the car owner. Likewise, he points out that the money spent for rentals in public garages will more than pay for a home garage in a reasonable length of time. He then shows the prospect that the deferred payment plan (described on page 23 of the booklet and illustrated here) allows the buyer to pay for the garage at about the same rate as would be charged for space in a public garage.



DEFERRED PAYMENT PLAN

Monthly payments can be arranged to suit your convenience, with a small additional Finance Charge over a period of one to twenty-four months, if you are a property owner. A minimum down payment of $10.00 is required on all time payment contracts. This enables you to pay for these garages out of your income rather than out of your savings.

PERMANENT-BILT

Page 23

Deferred payment plan is an important factor in the success of garage building business of C. Garrett Company, St. Louis

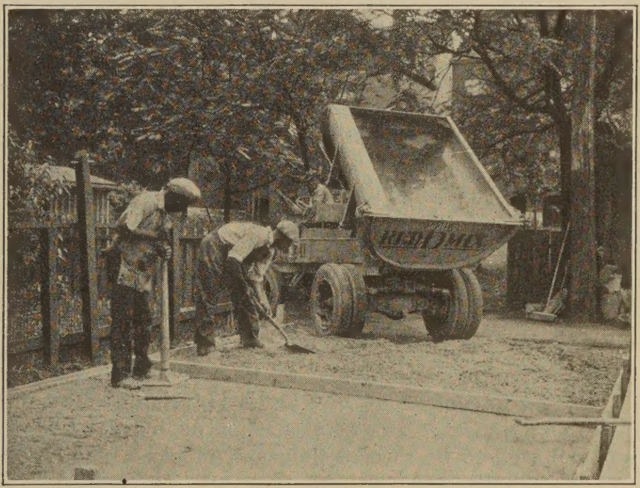
The company has developed such an enviable reputation for excellent service and high quality workmanship that a large bulk of the present business comes unsolicited through friends and satisfied customers. In fact, Mr. Garrett invariably gets the names of two or three prospects from each customer.

Several crews are at work all the time during the busy season—spring, summer and fall. Mr. Garrett is very much interested in their work and supervises each job himself, visiting each one as often as possible during the day. He insists on quality work and the best service.

Use Ready-Mixed Concrete

Ready-mixed concrete is used almost exclusively on every job because it is more convenient and because Mr. Garrett knows that the company furnishing the material maintains standard quality in its concrete. On the average garage floor job Mr. Garrett has found that the use of ready-mixed concrete represents a saving of several cents per square foot over concrete mixed on the job. Likewise, he figures that his overhead is reduced through eliminating necessity of moving mixers from one job to another and through elimination of repairs on such equipment. Although these things are important, the greatest advantage of using ready-mixed material, according to Mr. Garrett, is in being assured that the concrete is of high quality.

Mr. Garrett (right) supervising construction of concrete floor in a garage being built by his company



Ready-mixed concrete being delivered on garage floor job of the C. Garrett Company

Although the principal business of the company is devoted to building garages and concrete driveways, contracts are also taken for concrete sidewalks and ash pits. Work of this kind is usually solicited when a crew is building a garage or a driveway.

The Concrete Industry —25 YEARS AGO

"THERE is prevalent a mistaken notion relative to concrete. The architect often qualifies his approval of concrete as follows: 'No one can successfully dispute the fact that concrete is the coming building material for factories, warehouses, the less ornate office buildings; because it is the only absolutely fireproof building material,'" begins an editorial in the November 1904, issue of *The Cement Age.* "But when beautiful detail is required we must return to granite and marble," it continues.

It says further, "That this is not the case is amply disproved by our front cover illustration (showing bas-relief work used on a bridge). A plaster cast is made from any model—usually some classic—and into the mold is poured a fine concrete instead of plaster. By this method any work of art may be perpetuated in all its original beauty and in a substance that is imperishable to the ravages of the elements.

—‡—

THE Bellefontaine, Ohio, concrete pavements laid in about 1900 were reported to be "in almost perfect condition and so satisfactory in every way that concrete was adopted for the pavement of the large cantilever bridge across the Tennessee river in Knoxville, Tenn.

—‡—

CINDERS as aggregate were apparently of interest as early as 1904. At that time, quoting CONCRETE, "Cinders have been employed in the manufacture of concrete, principally for floor slab construction, for a considerable time, yet cinder concrete has not been studied as carefully and is not as well understood as it should be. It stands very high both in fireproof qualities and in its effectiveness to prevent iron from corroding."

—‡—

THE growing use of the term "reinforced concrete" instead of "concrete steel" is lauded in an article which goes into some detail on the uses of the material one-quarter century back. According to the item, the most common use of reinforced concrete in the United States is for floor slabs or arches supported by steel beams. "But it is an unfortunate fact that architects, as a rule, have not familiarized themselves with the principles involved in this sort of construction work, and a disposition to adopt some patented 'system' for this feature of building has been too common."

—‡—

THERE were four plants, in 1904, devoting their attention to cement and hydraulic building stone manufacture in Kansas. The combined output of these plants was reported to be several thousand blocks a day.

—‡—

THE concrete sea wall erected to protect the city of Galveston, Texas, following the ruinous flood of 1900, was reproduced in miniature at the St. Louis exposition of 1904 and a brief description of it appears in CONCRETE for November of that year.

The wall completed at that time was about 3½ miles in length. It was 16 ft. wide at the base and 5 ft. at the top and 17 ft. high above the average low tide.

Organizations

American Concrete Institute; Harvey Whipple, Secretary, 2970 West Grand Blvd., Detroit, Michigan.

Annual convention, February 11th, 12th and 13th, Roosevelt Hotel, New Orleans, La.

American Concrete Pipe Association; M. W. Loving, Secretary, 33 W. Grand Ave., Chicago.

American Construction Council; Dwight L. Hoopingarner, Executive, 28 W. 44th St., New York City.

American Engineering Standards Committee; Dr. P. G. Agnew, Secretary, 29 W. Thirty-ninth St., New York City.

American Road Builders' Association; Miss E. A. Birchland, Secretary, 29 W. Thirty-ninth St., New York City.

Twenty-seventh annual convention and road show, January 11th to 18th, 1930. Atlantic City, New Jersey.

American Society of Civil Engineers; Geo. T. Seabury, Secretary, 33 W. Thirty-ninth St., New York City.

American Society for Testing Materials; C. L. Warwick, Secretary-Treasurer, Engineers' Club Building, 1315 Spruce St., Philadelphia, Pa.

Associated General Contractors of America; D. H. Sawyer, Secretary, 1150 Munsey Bldg., Washington, D. C.

Cast Stone Institute; Frank M. Brooks, Secretary, P. O. Box 417, Pasadena, Calif.

Building Officials Conference of America; Col. John W. Oehmann, Secretary, 1253 Lawrence St., N. E., Washington, D. C.

Concrete Reinforcing Steel Institute; M. A. Beeman, Secretary, Tribune Tower, Chicago.

Iowa Concrete Products Association; R. L. Gavin, Secretary-Treasurer, 1002 Hubbell Bldg., Des Moines, Iowa.

National Association of Builders' Exchanges; Earl F. Stokes, Secretary, 15 E. Fayette St., Baltimore, Md.

National Concrete Products Association; A. G. Swanson, Secretary, Omaha, Nebr.

National Crushed Stone Association; J. R. Boyd, Secretary, 751 Earle Building, Washington, D. C.

National Fire Protection Association; Franklin H. Wentworth, Secretary, 40 Central St., Boston, Mass.

National Lime Association; Norman G. Hough, Secretary and Manager, 927 Fifteenth St., N.W., Washington, D. C.

National Sand and Gravel Association; V. P. Ahearn, Executive Secretary, 432 Munsey Building, Washington, D. C.

National Slag Association; H. J. Love, Secretary-Treasurer, 937 Leader Building, Cleveland, Ohio.

Northwest Concrete Products Association; W. P. Hews, Yakima, Wash.

Ohio Concrete Products Association; G. M. Friel, Secretary-Treasurer, 2284 North High St., Columbus, Ohio.

Portland Cement Association; William M. Kinney, General Manager, 33 W. Grand Ave., Chicago.

Rail Steel Bar Association; H. P. Bigler, Engineering Secretary, Builders' Building, 228 N. La Salle St., Chicago, Ill.

Wisconsin Concrete Products Association; Jack Franklin, Secretary-Treasurer, 3115 Plankinton Areade, Milwaukee, Wisconsin.

New Equipment and Materials

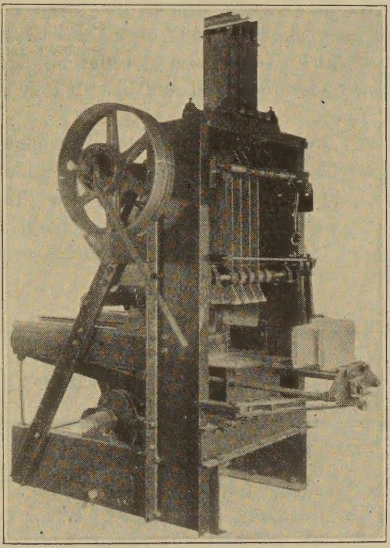
Eberling Launches New "Straight 8" Block Machine

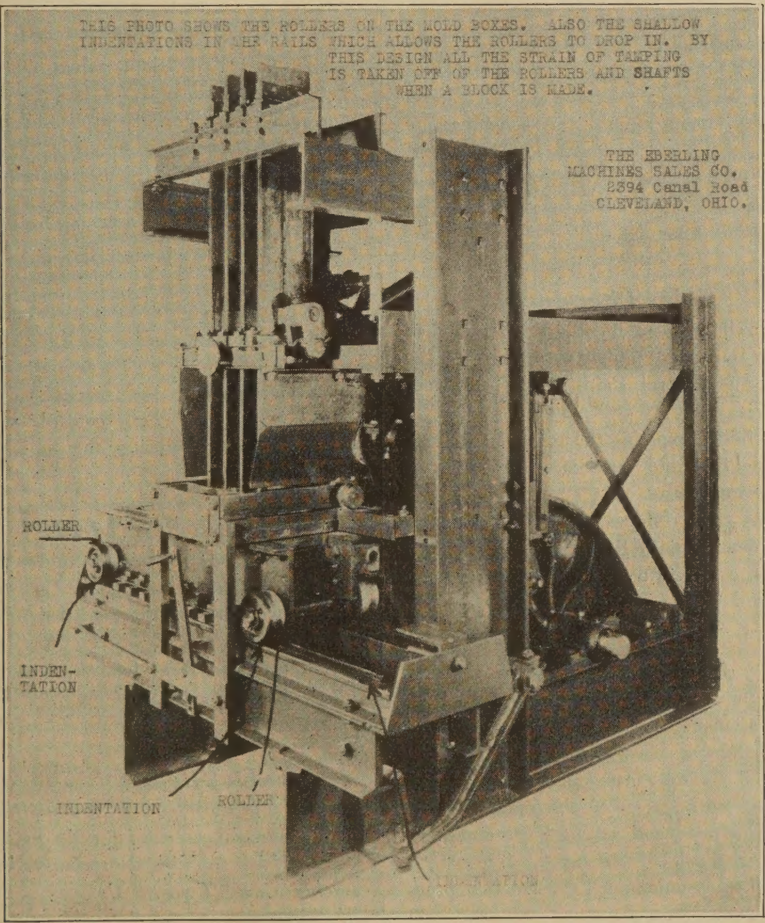
The larger of the accompanying illustrations shows the new "straight 8" concrete block machine which is one unit of a new line of concrete products making machinery now being introduced in the field by the Eberling Machines Sales Company, Cleveland, Ohio. Another is the new "4," shown in the smaller illustration.

The "straight 8" is said to be the only machine of its kind having a dual or twin mold box for the continuous flow of products without stopping the machine to take off the block. The "straight 8" is geared to make eight 8 by 8 by 12 in. blocks per minute, which may be increased somewhat when greater production is desired. Daily capacity is from 3,800 to 4,500. Twenty-five per cent more production may be obtained if a conveying system is used, the manufacturer states.

The eight tamping bars have a pressure of 800 lbs., tamping 5 times on each block. The mix is tamped as it is fed. Each tamper in dropping seeks its own level and the finished product is said not to show any lamination.

The machine is claimed to be 100 per cent automatic, being timed through the main shaft through a master cam. When starting the machine, the clutch lever is thrown in and operation remains continuous.





THIS PHOTO SHOWS THE ROLLERS ON THE MOLD BOXES. ALSO THE SHALLOW INDENTATIONS IN THR RAILS WHICH ALLOWS THE ROLLERS TO DROP IN. BY THIS DESIGN ALL THE STRAIN OF TAMPING IS TAKEN OFF OF THE ROLLERS AND SHAFTS WHEN A BLOCK IS MADE.

THE EBERLING
MACHINES SALES CO.
2394 Canal Road
CLEVELAND, OHIO.

Material is fed by a kicking device that showers or sprays concrete over the mold box. The kicker is adjustable, i. e., for heavy aggregates it is moved downward to the proper depth, and vice versa. S. K. F. bearings are used throughout.

Automatic mechanical control for every function is timed by the master cam. While the feeding and tamping operations proceed on one mold box, the ejector arms automatically strip the block in the other mold box, delivering it to the off-bearer and then the mold receives the pallet for the next block. Stripping, off-bearing and pallet feeding take place alternately to the right and left of the tamping position.

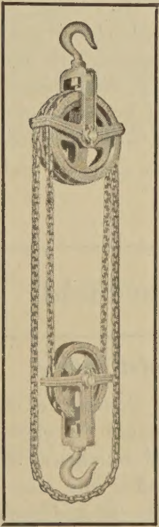
When the mold box is to be changed, the king pin is pulled and the dual box removed off the track and the new box slid in.

Five men can best operate the machine —two offbearers, one machine operator, one mixer man and one in the kiln.

The smaller "4" makes four blocks per minute and has the same construction throughout as the larger machine. One of its features are the 8 split tamper bars which are picked up intermittently. What is said to be an exclusive feature is the selective type feed.

This machine is not wholly automatic, but has a power cut-off and is stripped and power unloaded. It has a single mold box with a selective ejector and is mounted on a frame of 15-in. channels with 2 8-in. I beams.

Construction of New Chain Hoist



A differential chain hoist possessing three new features is announced by Robbins & Myers, Inc., Springfield, Ohio.

Timken thrust bearings are used in the lower hook to permit easy turning of the load in addition to reducing chain and upper sheave wheel wear caused by chain twisting. The sheaves are of Aremite, an alloyed iron produced in the Robbins & Myers foundry. Aluminum finish is used throughout, chains excluded, to provide protection against damage from exposure. The chains are of a special analysis steel, heat treated and electrically welded.

About Makers of Equipment and Materials

New Equipment

(*Continued*)

10-S Weigh-Mix New Koehring Product

The Koehring Company, Milwaukee, Wis., have combined the 10-S Dandie mixer with a weighing device to bring out the Koehring 10-S Weigh-Mix.

Designed for the jobs requiring concrete of pre-determined strength the Koehring 10-S Dandie Weigh-Mix proportions aggregates by weight and water by volume.

Each material is weighed separately on the three-beam scale. The water is measured by an accurate volume water measuring tank. The desired weight of stone is set on the stone beam and the weight of sand and cement on their beam, all materials being weighed in the skip. An indicator dial registers when the material being measured is nearing the desired weight on the beam.

The skip is cleaned automatically by a vibrator as the materials are being shot into the drum during charging. With this device the charging action is speeded up and a clean skip is provided for each batch.

When moving the 10-S Weigh-Mix from job to job, a two-wheeled rubber-tired trailer is attached to the mixer for carrying the scale and cradle. It is only a matter of minutes after arriving on the job to detach the trailer, lower the scale and cradle to the ground, and level properly. The machine is then ready for mixing.

The mixer operator controls charging as well as mixing and discharging, all operations being centralized in his control. Speed in weighing is aided by use of the double faced indicator dial, with a pointer in full view of the shovelers, inspector and operator.

Notes From the Field

New American Hoist Office

The American Hoist and Derrick Co. of St. Paul, Minn., has announced the opening of a branch office and warehouse at Los Angeles, Calif. The office and warehouse is located at 337 South Anderson Street.

W. H. Lummus, who has represented the American Hoist and Derrick Co. on the west coast for many years, is in charge of the Los Angeles office.

W. M. Cusac has been appointed to the Chicago sales force. Mr. Cusac was formerly with the McMyler Interstate Co. of Cleveland.

Post Manufacturer

The Permanent Concrete Equipment Association, Chicago, Illinois, has taken over the post mold interests of the *Permanent Products Company*, also at Chicago. Both companies are owned and operated by *H. B. Jones.*

Mr. Jones has recently been appointed as territorial manager for the entire middle west, by Transit Mixers, Inc., San Francisco, Calif. He will thus have charge of leasing transit mixers in exclusive territories.

Industrial Literature

Weigh-Mix Folder

A four-page folder issued by the *T. L. Smith Company*, Milwaukee, Wis., describes its Weigh-Mix, a complete proportioning and mixing unit that weighs and mixes all materials.

The inspector, according to the literature, sets the poise on the scale beams for any given specifications and then locks the beam box. Should the specifications change, the poise is moved to the desired point. Both scales are equipped with telltale indicators that show when the scales are approaching balance.

Color Literature

The reliability of its colors is stressed in a new four-page folder published by the Ricketson Mineral Paint Works, Milwaukee, Wis.

The folder explains the reasons for their dependability and some of the features of their manufacture.

Three small folders procurable upon request dealing with Ricketson's mortar and cement colors and cement paints are described.

On Super Cement

The latest publication to be issued on Super Cement coming from the *Marquette Manufacturing Company*, Chicago, Ill., concerns its use in some ten or eleven types of work, stressing the same density, waterproofness and strength obtained in all as a result of its use. Three pages devoted to recommended construction practice follow.

Giant Mixers Bulletin

Big mixers—the 56-S and the 84-S—are described in a new bulletin, *No.* 122, recently published by the *Ransome Concrete Machinery Company*, Dunellen, New Jersey.

The publication, consisting of eight pages, tells of the manufacture, in 1902, of unusually large mixers for the United States navy, by the Ransome company, and how the knowledge gained in that time is utilized in producing the present-day 56-S and 84-S.

Among the many features of Ransome "big" mixers, it continues, are an unusually strong main frame, drum rollers made of car wheel iron, Timken bearings protected by dust caps, drum roller tracks of solid locomotive tire steel.

Saving Time with Quikard

A number of interesting instances where Quikard cement was used advantageously comprise the bulk of the material contained in the latest booklet on *Quikard* cement published by the *Ash Grove Lime and Portland Cement Company*, Kansas City, Missouri.

Elevating Equipment

The New Red Giant Silent chain-spur gear drive, Model M, is described in a four-page loose leaflet published by the *Revolvator Company*, Jersey City, N. J. The two pieces of equipment described are the double telescopic Revolvator and a Portelator equipped with flanged wheels. Section views are shown, followed by tables of dimensions.

Some of the features of the Portelator listed are the automatic top limit stop for the platform, the reversing switch, which is synchronized with the mechanically operated brake and chain control, and the safety bars for lowering the top sections and forming a brace.

Lone Star Ideals

The most recent four-page folder coming from the *International Cement Corporation*, New York City, is that entitled *"Making Ideals a Practical Every-Day Reality,"* in which the brief text has to do with the ideals incorporated in Lone Star cement manufacture.

Double Diamond Cement

First announcement of *Double Diamond* early strength cement is made in a four-page folder published recently by the *Pacific Coast Cement Company*, Seattle, Washington.